NOT

MIL-R-28002B
14 December 1992

SUPERSEDING
MIL-R-28002A
30 November 1990

MILITARY SPECIFICATION

RASTER GRAPHICS REPRESENTATION IN BINARY FORMAT, REQUIREMENTS FOR

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 **Scope**. This specification identifies the requirements to be met when raster graphics data represented in digital, binary format are delivered to the Government.

1.2 **Classification**. The digital representation of raster graphics data is one of the following types as specified by the contract or other form of agreement:

Type I	-	Untiled Raster Graphics Data.
Type II	-	Tiled/Untiled Raster Graphics Data Type II of this specification is a delimitation of the Office Document Architecture (ODA) Raster Document Application Profile (DAP) to suit Government applications (see Appendix A).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be used in improving this document shall be addressed to : CALS Evaluation and Integration Office, þ CALS Digital Standards Office, HQ AFMC/ENCT, Wright-Patterson AFB, OH 45433-5001, by using the self-addressed Standardization Document Improvement Proposal

AMSC N/A AREA IPSC

2. **APPLICABLE DOCUMENTS**

2.1 **Government documents**.

2.1.1 **Specifications and standards**. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

STANDARDS

FEDERAL

FIPS PUB 150	-	Telecommunications: Facsimile Coding Schemes and Coding Control Functions for Group 4 Facsimile Apparatus.
FIPS PUB 157	-	Guideline for Quality Control of Image Scanners.

(Copies of the Federal Information Processing Standards (FIPS) are available to Department of Defense activities from the Standardization Documents Ordering Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094. Others must request copies of FIPS from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161-2171.)

MILITARY

MIL-STD-1840	-	Automated Interchange of Technical Information.

(Copies of the referenced military standards are available from the Standardization Documents Ordering Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094. For specific acquisition functions, the current revisions of these documents should be obtained from the contracting activity.)

2.2 **Non-Government publications**. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are Department of Defense (DoD) adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Y14.1	-	American National Standard, Drawing Sheet Size and Format.

ANSI/AIIM MS44-1988 - Standard for Information and Image Management - Recommended Practice for Quality Control of Image Scanners.

(Application for these documents should be addressed to ASME, United Engineering Center, 345 E. 47th Street, New York, NY, 10017)

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 8825-87 - Information Processing Systems - Open Systems Interconnection - Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1).

ISO 8879-88 - Information Processing - Text and Office Systems - Standard Generalized Markup Language (SGML).

(Copies are available from the Standardization Document Order Desk, Building 4D, 700 Robbins Ave, Philadelphia, PA 19111-5094, for issue to DoD activities only. All other requestors must obtain documents from the American National Standards Institute, 11 West 42nd Street, 13 Floor, New York, NY 10036.)

CONSULTATION COMMITTEE FOR INTERNATIONAL TELEGRAPHY AND TELEPHONY (CCITT)

CCITT Recommendation T.6 : 1988, Facsimile Coding Schemes and Coding Control Functions for Group 4 Facsimile Apparatus.

CCITT Recommendation T.4 : 1988, Standardization of Group Facsimile Appratus for Document Transmission.

(Copies are available from the American National Standards Institute Customer Service, 11 West 42nd Street, 13 Floor, New York, NY 10036.)

2.3 **Order of precedence**. In the event of a conflict between the text of this document and the references cited herein, the text of this document shall take precedence. Nothing in this document, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. **REQUIREMENTS**

3.1 **General requirements**. All digital raster graphics data complying with this specification shall conform to one of the two binary formats defined in this specification. Type I raster graphics binary format consists of Group 4 encoding as defined in FIPS PUB 150 (CCITT Recommendation T.6). Type II raster graphics binary format consists of ASN.1 or Office Document Language (ODL) and CCITT Recommendation T.6 encoding as specified by the document description presented in the ODA Raster DAP (Appendix A). Type I and Type II data shall not be combined within a single transfer set as defined by MIL-STD-1840.

The type of raster graphics data, Type I or Type II, shall be specified in the contract (see 6.2.1).

3.1.1 **Raster data file header records**. As specified in MIL-STD-1840, files of Type I or Type II raster binary data shall begin with a data block containing header records that characterize the image encoded by the raster data. The header record data block shall be present in all data interchanges regardless of the physical media or transfer mechanism used. Of these header records, the following selected records shall have the indicated permissible values.

3.1.1.1 **Raster data type**. The permissible values for raster data type shall be "1" or "2". This value shall be "1" to indicate Type I raster graphics data, or "2" to indicate Type II raster graphics data. This corresponds to MIL-STD-1840 header record "dtype" which is mandatory for both Type I and Type II.

3.1.1.2 **Raster image orientation**. The permissible values for the pel path direction shall be "0", "90", "180" or "270". The permissible values for the line progression direction shall be "90" or "270" (see 6.3.9). This corresponds to MIL-STD-1840 header record "rorient".

The values for pel path direction and line progression direction shall reflect the proper viewing orientation of each encoded image.

If so specified in the contract document, the contractor shall be required to perform rotation where necessary to achieve proper viewing orientation with pel path direction set to 0 and line progression direction set to 270 (see 6.2, 6.3.9, 6.3.15, and Appendix A).

3.1.1.3 **Raster image pel count**. The image sizes in section 6.3.2 are recommended for the standard page formats used in technical documents and large format drawings. If the image sizes shown in section 6.3.2 are not sufficient to meet a specific contract requirement, the image sizes shall be specified in the contract document (see 6.2.1 beginning with "As a guide").

3.1.1.4 **Raster image pel density**. Pel density shall be used to describe the number of samples per unit distance taken to create the raster image. This corresponds to MIL-STD-1840 header record "rdensity". Unless otherwise specified in the contract document, the pel density for raster images within technical documentation shall be 300 pels per inch. Unless otherwise specified in the contract document, the pel density for raster images representing large format engineering drawings shall be 200 pels per inch (see 6.2.1 and 6.3.10).

3.1.2 **Raster binary data**. As specified in MIL-STD-1840, Type I and Type II raster binary data shall

be contained in data blocks that follow the header data block.

3.1.2.1 **Byte (octet) boundaries**. An encoding program exporting documents from a system for interchange shall produce documents with a pel path dimension and a line count dimension which is multiples of eight pels. If so specified in the contract document, decoding systems may be required to be able to import documents which have arbitrary dimensions from other, non-MIL-R-28002 compliant systems.

3.1.2.2 **Definitions of one and zero in bitmap data**. A bitmap image or tile shall represent the information in a document by one bits and the background by zero bits (see 6.3.11).

3.1.2.3 **Bit ordering**. The bit ordering of most significant bit (MSB) to least significant bit (LSB) (the down ordering) shall be used for both compressed and bitmap data (see 6.3.5).

3.1.2.4 **Prohibition on recommendation T.6 escape option**. The uncompressed escape option defined in FIPS PUB 150 (CCITT Recommendation T.6) shall not be used. Variations to the algorithm described in a note in FIPS PUB 150 (CCITT Recommendation T.6) shall not be used (see 6.1.3).

3.1.3 **First article**. When specified (see 6.2.3), a sample system and set of raster data files shall be subjected to first article inspection (see 6.2.3) in accordance with 4.3.

3.2 **Specific requirements for Type II raster binary data**. When Type II raster binary data files are specified (see 6.2.1), they shall be prepared in accordance with Appendix A and this section. This section further delimits the options supported by the ODA Raster DAP of Appendix A to ensure unambiguous interchange to and from Government raster data systems.

3.2.1 **Untiled/tiled Type II**. If the Type II raster graphics data is to be specifically limited only to tiled or only to untiled data, the contract document shall specify Type II tiled or Type II untiled. If the contract document specifies Type II untiled, each file shall have a layout architecture in which each image has a single, undifferentiated block of raster data (see 6.2.2.d and 6.3.7).

3.2.2 **Tile index**. If so specified in the contract document, the tile index option in the "Application-comments" attribute of the specific block layout object in Appendix A shall be included in each Type II tiled raster file (see 6.2.2.e and 6.3.14).

3.2.3 **Tile orientation**. All tiles of a tiled raster image shall have the same orientation (see 6.3.15).

3.2.4 **Tile ordering**. Tiles of a tiled raster image shall occur in the file in pel path, line progression order (see 6.3.15).

3.2.5 **Tile size**. The size of all tiles of a tiled raster image shall be as specified in Appendix A.

3.2.6 **Tile types**. Tiles shall be one or more of the tile types as specified by the tile-type attribute in Appendix A (see 3.2.8 and 6.3.13).

3.2.7 **Padding of partially imaged tiles**. Decoding systems shall expect extraneous data in the unimaged portions of the tiles around the periphery of the document and guard against its presentation. When specified (see 6.2.2.c), encoding systems shall be required to set to background all such unimaged pels (see 6.3.8).

3.2.8 **Minimizing file size**. For tiled files, unless otherwise specified by the contract document (see 6.2.2.a), tiles which (had they been compressed) would have compressed negatively shall be delivered in bitmap form. For untiled files, unless otherwise specified in the contract document (see 6.2.2.a), images which (had they been compressed) would have compressed negatively shall be delivered in bitmap form (see 6.3.13).

3.2.9 **Multiple pages**. If a multiple page convention is specified in the contract (see 6.2.2.b), and a full-size and scaled-down image are included as separate pages within the same Type II document, the full size shall occur first in the file (see 6.3.6).

4. QUALITY ASSURANCE PROVISIONS

4.1 **Responsibility for inspection**. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements examinations and tests as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.1.1 **Responsibility for compliance**. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accepting defective material.

4.2 **Classification of inspections**. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.3).

b. Quality conformance inspection (see 4.4).

First article inspection shall be the inspection of samples of raster data file deliverables for conformance to this specification and verification that the contractor can meet the requirements of the contract. All data received for first article inspection shall also meet the requirements of the quality conformance inspection (see 4.4) for verification of the raster image quality.

Quality conformance inspection shall be the inspection of the raster data file deliverables for quality acceptance of the raster data in accordance with the contract. The acceptance of raster data under quality conformance inspection precludes the conformance of the deliverables with the requirements of this specification and the contract as specified under the first article inspection (see 4.3).

4.3 **First article inspection**. First article inspection shall be the inspection of the first article (see 6.2.3) raster data file deliverable, as defined by the contract, for its compliance with this specification. All first article inspections shall be performed on a contract specified system or on a system equal to the destination system that will eventually receive and store the raster data files being delivered under the contract. If the contract does not specify a system, all first article inspections shall be performed on an alternative system known to rigorously exercise all requirements and attributes of this specification. The use of the same system for encoding and decoding of raster image files is prohibited. First article inspection shall assure the quality of the encoded raster image files in accordance with this specification independent of the systems used for the encoding and decoding the raster data.

Raster data selected for the first article inspection shall be selected to rigorously exercise all attributes, values, and options for Type I and Type II data in accordance with this specification and the complexity of the required deliverables as specified in the contract. (For Type II data, the options are those found in Appendix A and are further delimited in Section 3.) Insofar as possible, inspection and analysis procedures shall be automated with appropriate computer programs that report analysis and inspection results. The Government may require the inclusion of Government-furnished or contract specified test charts or images with diverse image content (see 4.4.2).

4.4 **Quality conformance inspection**. Quality conformance inspection shall be performed on the raster data deliverable to assure conformance of the raster image to the requirements established by this specification and the contract. Inspection processes shall include, but not be limited to visual inspection of the raster data. Raster images shall be visually inspected and compared to the original image to ensure the legibility of text, lines are discernible and unbroken, and text, lines, and patterns appear sharp, without fussiness, smearing, or other indications of lack of focus. The visual inspection shall also compare the reproduced image to the original for the determination that the registration, linearity, alignment, coverage aspect ratio, and scale are identical to the original within the limits of this specification or the contract. Visual inspection shall be performed by either the printing of a paper copy or by the electronic display on a reference image system as specified in the first article inspection (see 4.3). Additionally, a visual inspection shall verify that the pel path and line progression direction values correctly describe the viewing orientation of the image. The Government may require the inclusion of Government-furnished or contract specified test charts or images with diverse image content (see 4.4.2). Such additional images, when included for quality conformance inspection, shall contain images covering the range of complexity equal to the contract deliverable.

4.4.1 **Data sampling**. Data sampling is prohibited unless specified by contract. When less than 100 percent inspection is performed, the digital data sample shall contain raster data representing all levels of complexity of the required deliverables as specified in the contract. Method of sampling and quantity of samples shall be specified by the contract.

4.4.2 **Raster image scanning**. The quality of a scanned raster image depends upon the capabilities of the scanner and the quality control procedures used to maintain the highest quality output of the scanner. When specified by contract ANSI/AIIM MS44 shall be used to verify the performance of the scanner in obtaining the highest quality output.

5. **PACKAGING**

Packaging of raster graphics data shall be in accordance with the requirements of MIL-STD-1840.

6. **NOTES**

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 **Intended use**. This specification is intended to be used by contracting agencies of the DoD in the procurement of raster graphics data and raster graphics applications. The specification presents raster graphics requirements which are applicable to interchange of raster encoded technical document pages, foldout illustrations, and large format engineering drawings.

Raster graphics representation specified herein consists of two types. Type I raster graphics data has a simple file format with no document architecture and is untiled (i.e., it is represented by a single compressed data entity). Type II raster graphics data has a document architecture conforming to the ODA Raster DAP (Appendix A). Type II data may be tiled and/or untiled as specified in the contract document.

Type I raster graphics requirements are intended to be used in procuring data for systems that only use untiled raster graphics representations. Examples of such systems include typical technical documentation systems and Digital Storage and Retrieval Engineering Data System (DSREDS)/ Engineering Data Computer Assisted Retrieval System (EDCARS) used by the Army and Air Force.

Type II raster graphics requirements are intended to be used in procuring data for systems that need the flexibility to use tiled or a mixture of tiled and untiled raster graphics representations. Tiled representations are best applied in systems handling large format drawings or illustrations typically associated with engineering design. The subdivision of a drawing into tiles permits use of only those portions of an image required at a given time by the application. This can result in reduced requirements for workstation memory and workstation display area. In addition, tiling permits compression and decompression activities to be performed in parallel upon the drawing tiles. Type II provides for untiled raster graphics for images considered too small to require tiling (i.e., A-size or smaller).

6.1.1 **Use of document architecture for Type II raster graphics**. It is the intent of this specification to use existing and emerging technology as the basis for implementation. Formats presented for Type II data use such technology. This ensures that raster graphics specification efforts are within the mainstream of evolving raster imaging technology and promotes interoperability with other raster graphics formats used in the office document architecture standard. It is the intent of this specification to use new mechanisms or objects only where existing work cannot reasonably accommodate specification needs.

6.1.2 **Type II raster graphics presentation and content attributes**. Appendix A presents the specific limits and defaults for each of the document architecture presentation and content attributes used to interchange Type II raster graphics data.

6.1.3 **Restriction to Group 4 compression**. This specification exclusively requires CCITT Recommendation T.6 (Group 4) compression for Type I and Type II raster graphics encoding with a bitmap option for Type II encoding. CCITT Recommendation T.4 (Group 3) compression is

specifically not supported. The uncompressed escape option defined in FIPS PUB 150 is not supported. Variations to the T.6 algorithm which are briefly mentioned in a note in FIPS PUB 150 (CCITT Recommendation T.6) are not supported.

For tiled raster graphics the ability to intersperse compressed and bitmap tiles as described by the "Tile-types" attribute in Appendix A meets several user requirements for tiled raster graphics content. A system or peripheral which must meet a given throughput requirement can selectively choose to leave uncompressed those tiles which do not compress in a specified amount of time. Similarly, this ability permits an upper bound to file size by using bitmap encoding for those tiles which (had they been compressed) would have compressed negatively. Both these requirements arise from the need to predict the behavior of an essentially statistical encoding technique.

6.2 **Ordering data**. The contract or other form of agreement should specify several items as indicated in the following subsections:

6.2.1 **Fundamental ordering data**. The following information must be included in any contract:

a. Title, number, and date of this specification.

b. The type of raster graphics data being procured as Type I or Type II or both (see 3.1).

c. The delivery medium to be used (see 5).

d. Proper viewing orientation (see 3.1.1.2).

e. The raster image pel density (see 3.1.1.4).

f. Image sizes, including overscanning (see 3.1.1.3).

6.2.2 **Additional ordering data for Type II procurement**. The following items should be included if they are needed by the contract:

a. Minimal file size option (see 3.2.8).

b. Multiple page conventions (see 3.2.9).

c. Padding of partially imaged tiles (see 3.2.7).

d. Interchange of untiled/tiled Type II (see 3.2.1).

e. Tile index (see 3.2.2).

f. Tile types (see 3.2.6).

6.2.3 **First article**. When first article inspection is required, the contracting officer should provide specific guidance to offerors whether the item should be a preproduction sample, a first article sample,

a first production item, a sample selected from the first production items, or a standard production item from the contractor's current inventory, and the number of items to be tested. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation. The contract must specify a reference system for first article test (see 4.3).

6.2.4 **Data acceptance**. This specification does not address data acceptance at the content level. When data acceptance of raster data is required, the contract should define the acceptance requirements, require data acceptance procedure(s), and specify who, where, and by whom the data acceptance procedures will be implemented.

6.3 **Data requirements**.

6.3.1 **File size and efficiency considerations**. Files containing large format drawings or illustrations in raster graphics form are relatively large. After CCITT Recommendation T.6 (Group 4) compression, E-sized drawings have a file size of approximately one-half of a megabyte for a moderately detailed drawing. For tiled raster graphics files, a tile index permits direct access to image tiles contained in the content stream. The format of this index is described in Appendix A. The tile index is only supported by tiled raster graphics applications and is placed in the "Application-comments" attribute associated with the block layout object of the tiled raster graphics content. The index is optional in the ODA Raster DAP (Appendix A) because it is possible for a receiving application to reconstruct a tile index from an imported file.

6.3.2 **Image sizes for drawings**. The drawing sizes, A through K, specified by ANSI Y14.1 and metric drawing sizes, A4 through A0, are summarized in the following tables. Shown are the nominal number of pels per line and the nominal number of lines. These values are for the default pel density for a large format image size of 200 pels per inch.

The numbers listed below are minimal, sufficient only to provide for byte alignment of the pels at the end of each bitmap line. 200 pels per line and 200 lines of total overscan would provide a recommended nominal one inch overscan without loss of byte alignment. This is not shown added into the numbers below, but would be consistent with current industry practice. Particular requirements associated with overscanning should be identified and specified in the contract document to allow extra white space at the margins, if needed.

Over-scanning is a function of capturing raster images from hard-copy documents in a production environment and may vary from system to system. A typical by-product of over-scanning is image noise which may significantly enlarge the resulting image file. The amount of over-scan and the cost of trimming the edges of a scanned image during the quality assurance (QA) process should be evaluated (on an application basis) to determine the overall impact on an individual application. The quantity and quality of the over scan around the edges of an image may add significant to the amount of data being

stored. Demonstrations have shown a significant reduction in image size can be gained by simply cropping the image during the QA process. The cost benefits of 100 percent QA and the cost of processing and storing larger images should be evaluated for the various applications using MIL-R-28002B data.

TABLE I. North American drawing sizes.

Drawing Size	WxL(max) (inches)	Pels Per Line	Number of Lines
A	8.5x11	1704	2200
B	11x17	2200	3400
C	17x22	3400	4400
D	22x34	4400	6800
E	34x44	6800	8800
F	28x40	5600	8000
G	11x90	2200	18000
H	28x143	5600	28600
J	34x176	6800	35200
K	40x143	8000	28600
Legal	8.5x14	1704	2800

TABLE II. Metric drawing sizes.

Drawing Size	W x L (max) (mm)	Pels Per Line	Number of Lines
A4	210 X 297	1656	2344
A3	297 X 420	2344	3312
A2	420 X 594	3312	4680
A1	594 X 841	4680	6624
A0	841 X 1189	6624	9368

6.3.3 Generation of raster data by scanning. Raster data for either technical publication or product definition materials may be generated by scanning source document sheets or pages in accordance with this specification. Scanning is performed in a line-by-line sequence from left to right, beginning at the leading edge of a page as it is fed into the scanner, and at a standard pel spacing selected to preserve the smallest detail (minimum line pair spacing) represented in the source material. Note that the image orientation may be such that the top of the image does not correspond to the leading edge of the scanned page. This scan-produced raster data is initially stored in intermediate, digital form as a binary bitmap such that respective ones and zeros reflect the black and white physical picture elements of the scanned image. In this intermediate or expanded form, raster scan data may be processed for enhancement or editing, or directly reproduced by an appropriate display or printing device.

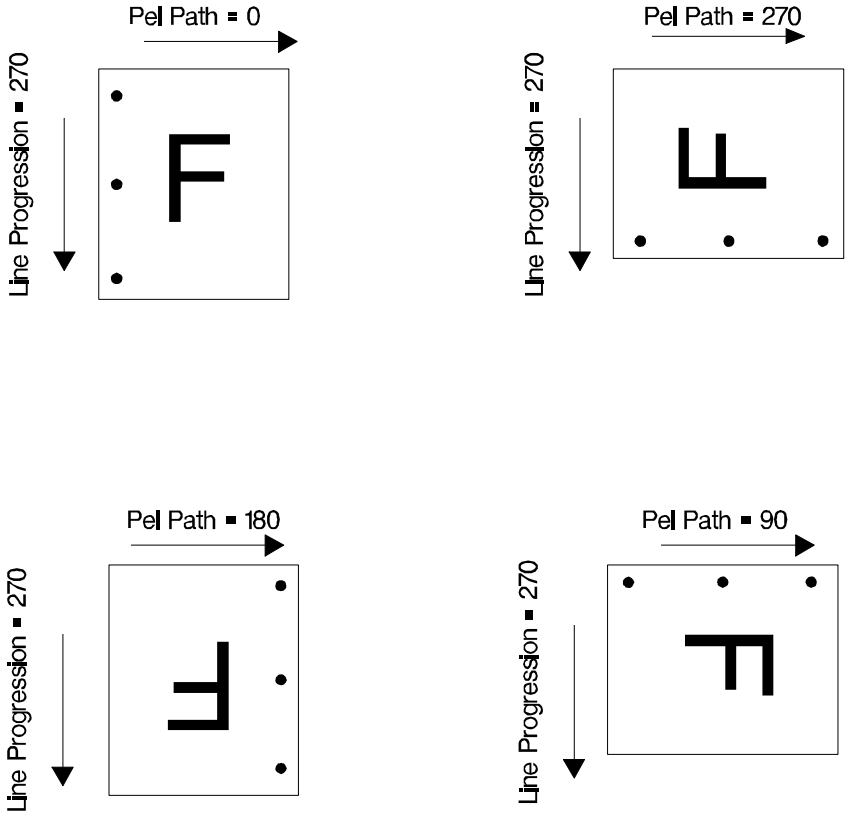
The relationship between the orientation of scanning and the orientation of image display must be accurately specified in the raster graphics presentation attributes. The relationship between the pel path and line progression attributes for typical images are shown in figure 1 for portrait pages and in figure 2 for landscape pages.

The orientation of the scanned image must be provided in the orientation parameter such that a receiving system may render the image as the author had intended (proper orientation for viewing). If there is a discrepancy between the MIL-STD-1840 file header and the binary ODA encoding, the latter shall take precedence.

6.3.4 **Additional data processing conditions**. This specification defines the data formats required to describe pages or sheets of Type I or Type II raster graphics content. Issues related to database management such as document information, aperture card Hollerith code, document and page relationships, sheets, revisions, and multiple aperture card frames are not considered in this specification. If such data is required as a deliverable, the procurement contract should specify the content and format of such data in accordance with MIL-STD-1840.

6.3.5 **Note on bit ordering**. While this specification calls for the bit ordering of most significant bit (MSB) to least significant bit (LSB)--the down direction--for both compressed and bitmap data, the

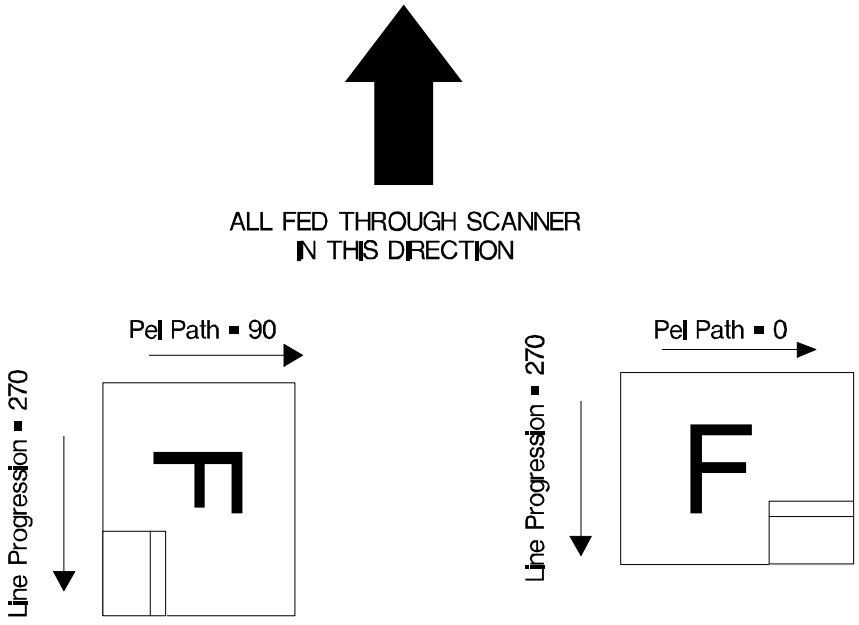
ALL FED THROUGH SCANNER
IN THIS DIRECTION



Note 1: The pel path direction is measured in degrees counterclockwise from the positive horizontal axis (east).

Note 2: The line progression direction is measured in degrees counterclockwise from the pel path direction.

FIGURE 1. Position of pels, portrait document.



Note 1: The pel path direction is measured in degrees counterclockwise from the positive horizontal axis (east).

Note 2: The line progression direction is measured in degrees counterclockwise from the pel path direction.

FIGURE 2. Position of pels, landscape document.

proper ordering of bits within bytes (octets) is a subject of industry-wide dispute. The traditional method in facsimile equipment for compressed data is to pack code bits into bytes in up fashion, that is, LSB to MSB. The most widespread method used in sending bitmapped (uncompressed) data to computer display adapters is with a down ordering (MSB to LSB).

Although the normal mode of operation for DoD can be MSB to LSB bit ordering, decoding systems may be required to be able to import documents from other non-MIL-R-28002 compliant systems which have the bit ordering of LSB to MSB for compressed data in Type II files. In such instances, the contract document may specify the LSB to MSB ordering for compressed Type II data.

6.3.6 **Note on multiple pages**. In Type II files, a document may contain multiple pages (as pages are defined within ODA). Each page shall contain a single raster image. They may also be used to contain an original image and a scaled down overview image. The sheets of a multiple-sheet paper drawing or multiple-card aperture card drawing may also appear as pages within the same document. An agreement must be reached between parties exchanging data, or in the contract document, that identifies the allowed uses of this mechanism and how these uses are to be distinguished from each other.

6.3.7 **Note regarding Type II untiled/tiled**. It is understood that permitting untiled Type II data confuses the meaning of Type II. If Type II is to be restricted to only tiled or untiled raster data, it is necessary that a Type II file be requested as "Type II tiled" or "Type II untiled", whichever is intended.

6.3.8 **Note regarding padding of partially filled tiles**. In Type II tiled files, a document's size along either dimension will not, in general, be a multiple of 512 pels. This means that some unused data can exist in tiles around any or all of the document's four edges. In the document architecture underlying Appendix A, the unused data outside the clipped pel array is not considered information. Decoding systems should therefore operate as if extraneous data will exist in those pels and guard against its presentation. Compression will, however, be improved if zeros fill the unused pels. Encoding systems may not explicitly set those pels. Some systems may get a needed price or performance benefit from not zeroing the data.

6.3.9 **Notes regarding orientation**. The raster image orientation is stipulated in the file by two attributes, pel path and line progression. The values for these attributes reflect the proper viewing orientation of the image. These two attributes tell an application how to extract the pels from the bitmap array and deposit these pels on the page when rendering the image. Raster image orientation is dependent on the orientation of the scanned medium relative to the scanning mechanism. For typical technical documentation, the pel path direction is 0 degrees and the line progression direction is 270 degrees. The relationship of pel path to line progression directions for a typical piece of portrait technical documentation is depicted in figure 1. For typical large format documents, the pel path direction is 90 degrees and the line progression direction is 270 degrees. The relationship of pel path to line progression directions for a typical landscape large format document is depicted in figure 2.

In figures 1 and 2, four pages are shown. Each has been fed through a scanner in the direction shown by the large arrow. Immediately after scanning and before the quality assurance/visual inspection step, the proper viewing orientation would not be known to the system; each would be identified (some incorrectly) as having a pel path direction of 0 degrees and a line progression direction of 270 degrees.

After the visual inspection step, each would have been (correctly) identified with the values shown in figure 1 placed into their files.

Printers and other peripherals may require images to have data presented to them in other than "proper viewing orientation." This is a system-dependent requirement and does not have any impact on the interchange file contents.

Note that four other orientations are possible which are the mirror images (around one axis) of the four shown. These could result from scanning an aperture card, paper sepia or transparency from the "wrong" side, either inadvertently or to achieve better image quality.

See paragraph 6.3.15 for an explanation of Type II rotation and orientation.

6.3.10 **Note regarding raster image pel density**. Typical pel density values might include 100, 200, 240, 300, 400, 600, and 1200 pels per inch. Support for some of these pel densities may be desirable for interchange of data with non-military systems. Appendix A provides a mechanism for the interchange of any pel density provided it is identified in the document profile as a non-basic value. Since Appendix A has 300 dpi as the default, the defaulting mechanism in Appendix A should not be used for this parameter if it is desired to have 200 dpi.

6.3.11 **Note regarding one and zero in bitmap data**. Raster data represents each pel in the source document by a zero or a one. A one is an information pel. The "information" pels in an image are those which make it differ from a blank image (see 3.1.2.2).

6.3.12 **Notes on scanning quality**. Data encoded according to this specification may come from a scanning process, an image conversion process, and/or an electronic creation/modification process. Scan quality relates to the scanning process (though the same analysis may be performed on converted images where the results of the analysis would have little bearing on the conversion process and more on the production process of the original image). The scanning process renders an image of a document as a set of data elements. FIPS PUB 157, Guideline for Quality Control of Image Scanners, provides guidance on the factors influencing scanned image quality. Typically, scanning quality is enhanced by a control step that enables a workstation operator to improve the quality of the image before final raster graphics file creation. Scanning devices and the processes associated with scanning require regular inspection procedures to ensure high-quality operation of the scanner hardware and appropriate performance of scanner and image quality control personnel. Such inspections are critical in an operating environment where actual raster graphics file usage may occur many years after scanning.

Some of the factors involved in raster scanning quality are listed below. Determination of factors a) through n) requires reference to the original document. Factors o) and p) may be determined after the original document is no longer available.

a. **Contrast**. While contrast in a raster image is normally concerned with treatment of grayscale and texture in the image, the treatment of lines, texture and textual characters is also affected by contrast. In binary raster data, intensity-level contrast is not at issue. In this context, contrast is established in the scanning process itself, and is dependent on

the scanning resolution, the sharpness of the image and the threshold level at which a pel is digitized. If contrast is too high, characters may be filled in, pattern-density shading may result in solid regions of set pels, and double lines may be merged. If contrast is too low, fine lines and pattern-density shading may be lost completely.

b. **Focus**. Focus affects the sharpness of a raster image. Diminished focus is characterized by shallow pel-density gradient in one or both dimensions. The result is a fuzzy appearance, and reduced susceptibility of the image to optical character recognition or edge-detection algorithm treatment.

c. **Alignment**. Most engineering drawings have many straight line segments aligned with the length and width of the page. If the scanned image axes are correctly aligned with scanner axes, each line segment in the set is contained in a pel row or column (or contiguous pair, triple, etc. of rows or columns), and the line image appears straight and sharp. If the scanned image is slightly misaligned (or skewed), each line segment from the set is stair-stepped in its representation, In addition to affecting the appearance of the image, misalignment reduces the effectiveness of compression routines.

d. **Aspect ratio**. Aspect ratio refers to the scale in the vertical dimension as compared to the horizontal dimension. Unless otherwise specified, the aspect ratio of scanned images is usually unity (i.e., the number of pels required to represent one inch of the drawing horizontally is equal to the number of pels required to represent one inch of the drawing vertically).

In measuring the aspect ratio, if linear scales are not present in both dimensions on the drawing itself, the original drawing dimensions must be known, or measurements must be taken from it. Aspect ratio is calculated from the formula:

$$AR \quad \frac{Pv \times Lh}{Ph \times Lv}$$

where:

AR is the dimensionless aspect ratio.
Pv is the number of pels in the vertical dimension.
Lh is the represented length in the horizontal dimension.
Ph is the number of pels in the horizontal dimension.
Lv is the represented length in the vertical dimension.

e. **Linearity**. The number of raster image pels required to represent a unit of vertical or horizontal length in the original drawing should ideally be a constant at every point in the image (i.e., the pel-length relationship is linear). If the relationship is non-linear in either the horizontal or vertical direction, diagonal line segments will appear to be curved or wavy, and the image cannot be used for measurement purposes.

f. **Orthogonality**. While most systems are designed so that the two independent scanning dimensions are mutually orthogonal, alignment errors can occur in the scanning process, causing a deviation from orthogonality. This causes rectangles to appear as parallelograms. Orthogonality deviation is the number of degrees by which the angle between the two dimensions differs from 90 degrees.

g. **Pel density**. Pel density of the scanned raster image is normally expressed in image pels per original-drawing inch. Generally speaking, image quality improves with pel density. In the case of images scanned from 35-mm aperture card images, there is a practical limit to the effect of increased pel density on image quality, namely the resolution of the film image. Attempts to represent highly textured drawings with insufficient pel density may result in distortions, such as Moire patterns.

h. **Coverage**. Coverage is the portion of the desired region of the original drawing included in the raster image. A coverage of 100% ensures no data is lost. Determination of coverage by reference to the original drawing is particularly important for those engineering drawings or technical documents that do not have borders.

i. **Registration**. Registration is a measure of the positioning of the raster image in the desired image medium area. Registration is the distance in pel rows or pel columns of the imaged area from the corresponding edges in the raster image. If the image is badly registered, excessive borders may appear and/or some coverage may be lost.

j. **Resolution**. The resolution which an imaging system can reproduce determines the minimum feature size which is recognizable. Due to the linear pickup devices and the non-symmetrical responses of the binarization electronics of many scanners, it is desirable to measure horizontal, vertical, and diagonal resolution as well as black on white and white on black resolution.

k. **Scale**. The scale (or magnification) of the raster image should accurately and consistently portray the size of the original drawing. The capability of the imaging system to accurately reproduce a scanned image can be measured. Horizontal and vertical scale accuracy can vary independently. It is also useful to determine the black and white scale ratio, which is used to determine whether lines are thickened or thinned by the digitization process.

l. **Continuity**. Continuity is the ability of the imaging system to maintain the complete image without adding breaks to lines.

m. **Aliasing**. Aliasing is a group of image defects generally caused by elements of the scanned image being smaller than and/or not registered with the picture element created by the scanner. An aliasing effect occurs when stair-stepping or jaggedness is introduced in a feature. Aliasing can affect the image quality, readability, and accuracy of the raster image.

n. **Readability**. Readability is a subjective decision made as to whether an image can be read. The sizes of features on the original document affect the readability of the image as do many other factors including the person reading them. Even though it is a subjective evaluation, readability is a useful indication of the quality of the image produced by the system.

o. **Cleanness**. Cleanness is the relative freedom from random flecks or amorphous dirt spots in the image representation. In addition to detracting from clarity in representing objects, flecks and spots in an image can also severely diminish the degree of compression achievable. If dirt appears in the image area to the extent that the image is obliterated, obscured or defaced, then a major defect exists. The presence of dirt without obliterating, obscuring or defacing the image constitutes a minor defect. Dirtiness can be measured as the dimensionless ratio of the number of wrong pel values to the total number of pels in a specified region of the image.

p. **Evaluation of the scanning process**. Evaluation of the scanning process can be achieved quantitatively at the point of acceptance by measuring all factors in a known standard test pattern scanned with each batch of drawings submitted for acceptance. At that time, application of factors a-n should form a basis for acceptance or rejection of the material.

6.3.13 **Note regarding minimizing file size**. The size of Type I data file cannot be minimized. The size of Type II data file may be minimized by controlling two characteristics of the image: (1) uncompressed versus T.6 encoded and (2) in the case of tiling, null background/foreground.

A tiled Type II data file could have all tiles uncompressed and still be compliant with Appendix A. However, to minimize the file size, the normal practice is to include uncompressed (bitmap) tiles in the image data only when the tile would negatively compress. The contract may specify that all tiles will be delivered as T.6 encoded tiles (no bitmap tiles). Tiles are controlled by the Tile-types attribute specified in Appendix A. The contract may also make a similar requirement for untiled Type II images whereby all images are to be delivered as T.6 encoded images even though they would negatively compress (e.g. halftones). This latter case is indicated by the Type-of-coding attribute specified in Appendix A.

The contract may also require that bitmap tiles be included under certain circumstances in order to meet some system timing constraint. If so, the contract must stipulate the specific requirements for including the bitmap tiles.

As stated in Appendix A, if the Tile-types attribute is present in the tiled raster graphics content attributes, then there must be a value specified for each tile, in which case only null background, null foreground, T.6 encoded -LSB, T.6 encoded - MSB, or bitmap encoded values are supported. (see 3.1.2.3 and 6.3.5). Tiles that are all background or all foreground (see 6.3.12) may be encoded in two ways according to Appendix A. An all background tile may be encoded as Appendix A Tile-types null background or as Tile-types T.6 encoded. Similarly, an all foreground tile may be encoded as Appendix A Tile-types null foreground or as Tile-types T.6 encoded. T.6 encoded tiles result in about 67 more bytes per tile than null background tiles and about twice that for null foreground tiles. Where

processing time is a concern, better performance can be achieved by encoding null foreground/background tiles as T.6 tiles.

6.3.14 **Tile index option**. In tiled Type II data, the tile index may be specified as an option in the Application-comments attribute of a block layout object. It contains a list of byte offsets from the beginning of the content information of the content portion to the beginning of each tile in the image. The index is of variable length and cannot be entirely known until the attempt to compress all tiles has been made. This can degrade performance of scanning environments. In editing and other applications, the index aids initial access to the image, but imposes performance and memory penalties on any save operation if the tile index changes due to modifications to individual tiles. There is a potential index integrity problem in that the index may not agree with the actual tile locations. If a system receiving data relies upon this index, it would not be able to process the file. However, the system could read the file by ignoring the index and creating its own index as the file is processed. All of these factors should be thoroughly evaluated before requiring the tile index in the contract deliverables.

6.3.15 **Type II orientation and rotation**. The pel path and line progression attributes expressed in the binary data section as ISO 8613 (ODA) data, tell an application how to deposit pels on the page when rendering the image. If it is desired to direct an application to rotate an image for display, only the pel path and line progression parameters need to be changed. Any supporting application should then render the tiles properly (by decompressing, rotating and positioning each tile appropriately).

The biggest issue for rotation concerns efficiency for the rendering application. If the speed of displaying the image is important and the tiles must be rotated before rendering, it may be desirable to re-format the data so the tiles do not need to be rotated each time the image is to be rendered. In this case, the re-formatter will need to decompress each tile, rotate the tile, recompress the tile, and save it temporarily until all the tiles are processed, then re-order the tiles according to the new pel path and line progression attributes.

For an example, assume that an original image had a pel path of 90 degrees and line progression of 270 degrees. The tile order is illustrated in figure 3. Tiles in the data stream are ordered in the following sequence: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12. This would be typical for landscape oriented documents scanned in portrait orientation. (See figure 2 illustration of pel path 90 and line progression 270). To reduce the need for applications to rotate the tiles for viewing, it may be desirable to rotate, recompress the tiles, and set the image orientation (pel path and line progression) to 0 and 270 degrees. (See figure 2 illustration of pel path 0 and line progression 270).

1	2	3
4	5	6
7	8	9
10	11	12

FIGURE 3. Example of tile order (before rotation).

The steps to perform this rotation are:

a. Decompress each tile, rotate it counterclockwise by 90 degrees and recompress the tile. Place the tile in temporary storage until all are done.

b. Once all tiles are processed, re-order the tiles so that the tile containing the new top left corner is the first tile.

c. Set the image pel path and line progression to 0 and 270 degrees, respectively.

d. Compute new image width/heights and offsets for the image where needed. This is required if the image size is not an even multiple of the tile size. In this case, the unused image space has now moved from the bottom right to the top right. The x axis offset into the image is still 0, but the y axis offset is equal to the unused space on the right of the original image.

The new tile order is illustrated in figure 4. The tiles in the data stream (based on original tile numbers) are ordered in the following sequence: 3, 6, 9, 12, 2, 5, 8, 11, 1, 4, 7, 10.

3	6	9	12
2	5	8	11
1	4	7	10

FIGURE 4. Example of tile order (after rotation).

In summary, unless there are some peculiarities in the display or printing environment that require unrotated data and 0 offsets, an application should never need to decompress, re-tile and recompress to rotate. Rotating each tile should be sufficient (assuming the application also re-orders the tiles in the data stream). Any compliant image rendering application should be able to deal with rotated tiles as is, although some efficiencies may be gained by having the tiles in "normal" viewing orientation.

6.3.16 **Type II data structures**. Type II raster binary data consist of Office Document Architecture/ Office Document Interchange Format (ODA/ODIF) data structures encoded using Abstract Syntax

Notation One (ASN.1). The data structures and encoding rules for Type II raster graphics data are presented in Appendix A.

6.3.17 **Changes from previous issue**. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

6.4 **Definitions**.

6.4.1 **Acronyms**. Acronyms used in this specification are defined as follows:

a.	ASN.1	Abstract Syntax Notation One.
b.	ANSI	American National Standards Institute.
c.	ARA	Assured Reproduction Area.
d.	BMU	Basic Measurement Unit.
e.	CAP	Communication Application Profile.
f.	CARA	Common Assured Reproduction Area.
g.	CCITT	Consultative Committee for International Telegraphy and Telephony.
h.	DPI	Dots Per Inch.
i.	DTAM	Document Transfer, Access and Manipulation.
j.	FTAM	File Transfer, Access and Manipulation.
k.	ISO	International Organization for Standardization.
l.	LSB	Least Significant Bit.
m.	MSB	Most Significant Bit.
n.	NIST	National Institute of Standards and Technology.
o.	ODA	Office Document Architecture.
p.	ODIF	Office Document Interchange Format.
q.	OSI	Open System Interconnection.

r. SDIF SGML Document Interchange Format.

s. SGML Standard Generalized Markup Language.

6.4.2 **Glossary**.

6.4.2.1 **Attribute**. An element of a constituent of a document that has a name and a value and that expresses a characteristic of this constituent or a relationship with one or more constituents.

6.4.2.2 **Basic value**. Attribute value that is unconditionally allowed in document interchange in the context of a given application profile.

6.4.2.3 **Bitmap**. A two- or three-dimensional data field representing a pel array.

6.4.2.4 **Block**. A basic layout object that corresponds to a rectangular area within a frame and consisting of only a single type of content, i.e., raster graphics content.

6.4.2.5 **Byte boundary**. A position in a binary data stream where, if the stream were packed into bytes (octets), an integer number of completely filled bytes would result.

6.4.2.6 **Clipping**. The actual pel array to be imaged as determined by applying all clipping parameters.

6.4.2.7 **Composite page**. A page that is subdivided into subordinate frames consisting of blocks.

6.4.2.8 **Compression**. An operation performed on raster image data to remove redundant information and thus reduce the stored or interchanged size. Negative compression is the case where this operation results in an increase rather than a decrease in size.

6.4.2.9 **Decoding**. The process of deriving a bitmap from an octet string by translating any compression algorithm used to create the octet string.

6.4.2.10 **Decoding system**. A program that reads and interprets a file of the specified type, which may not have been produced locally.

6.4.2.11 **Document type definition (DTD)**. Rules, determined by an application, that apply SGML to the markup of documents of a particular type. A document type definition includes a formal specification, expressed in a document type declaration, of the element types, element relationships and attributes, and references that can be represented by markup. It thereby defines the vocabulary of the markup for which SGML defines the syntax.

6.4.2.12 **Default value**. Attribute value that is the standard value in document interchange in the context of a given application profile.

6.4.2.13 **Document application profile (DAP)**. The result of selecting a particular document

architecture level; content architectures; a document profile level; an interchange format level; objects and attributes with classification of attributes into mandatory, non-mandatory, and defaultable; and definitions of basic, non-basic, and default attribute values, and control function parameter values.

6.4.2.14 **Encoding**. The process of deriving compressed data from a bitmap by applying a compression algorithm to the bitmap.

6.4.2.15 **Encoding system**. A program which produces or outputs for export a file of the specified type.

6.4.2.16 **Frame**. A type of layout object that corresponds to a rectangular area within a page.

6.4.2.17 **Header**. Control or attribute information that is prefixed to a block of user data.

6.4.2.18 **Initial point**. The point relative to which all pels are positioned within a page. It does not necessarily lie at a corner of a tile in the tile grid.

6.4.2.19 **Layout characteristics**. A description of the elements, i.e., page, block, of a document and the relationship between the elements.

6.4.2.20 **Line progression**. The direction of progression of successive lines of pels in an image.

6.4.2.21 **Non-basic value**. Attribute value that is only allowed in document interchange in the context of a given application profile if its use is declared in the document profile.

6.4.2.22 **Octet**. A subdivision of bits numbered from 8 to 1 where bit 8 is the most significant bit and bit 1 is the least significant bit. (Also known as a byte.)

6.4.2.23 **Page**. A type of layout object or layout object class that corresponds to a rectangular area used as a reference area for presenting the content of the document.

6.4.2.24 **Partial tiles**. In a tiled image of a document, the incomplete tiles which may occur on any or all of the four sides of the tile array when the image has been positioned and clipped. Also known as runt tiles.

6.4.2.25 **Pel (picture element)**. The smallest graphic element that can be individually addressed within a picture. Synonymous with pixel.

6.4.2.26 **Pel array**. A two-dimensional array of pels used to represent a pictorial image.

6.4.2.27 **Pel density**. The number of pels per unit distance in a raster image.

6.4.2.28 **Pel path**. The direction of progression of successive pels along a line in an image.

6.4.2.29 **Pel spacing**. The distance between any two successive pels along a scan line of an image. It

is the inverse of such often used terms as pel density, transmission density, or resolution. Note that resolution as discussed in 6.3.13.j is a different concept.

6.4.2.30 **Raster graphics**. The electronic data processing medium used to depict any arbitrary assemblage of text characters, graphical figures, or pictorial images with a pel array.

6.4.2.31 **Raster graphics content**. The raster graphics portion of a document that is intended for human perception.

6.4.2.32 **Spacing ratio**. The ratio of line spacing to pel spacing.

6.4.2.33 **Tile**. A rectangular region in a layout object in which all such regions have the same dimensions, no part of any region overlaps any other region, and regions are positioned in a fixed grid, determined by partitioning the layout object into region-sized areas.

6.4.2.34 **Tile index**. An application comment in Type II files which contains a list of byte offsets from the beginning of the first tile to the beginning of each tile in the page.

6.5 **Subject term listing**.

CALS
Binary
Digital
Image
MIL-STD-1840
Raster
Raster graphics file
Scanning
Tiled
Untiled

APPENDIX A

STABLE IMPLEMENTATION AGREEMENT for OPEN SYSTEMS INTERCONNECTION PROTOCOLS: PART 23 - ODA RASTER DAP

10. SCOPE

10.1 **Scope**. This is the definition of a specification for an Office Document Architecture (ODA) Document Application Profile (DAP) named ODA Raster DAP. This DAP is suitable for interchanging documents in formatted form. The documents contain only raster graphics images. There are two DAP object identifiers supporting this DAP with the only difference being in the encoding of the data stream. One uses the ASN.1 based ODIF encoding. The other uses the SGML/SDIF based ODL encoding. When this document refers to this profile, it is referring to this specification regardless of which DAP identifier may be selected to create the data stream.

This DAP has been prepared by the ODA Special Interest Group (SIG) of the Open Systems Environment Implementors' Workshop (OIW). The DAP is defined in accordance with ISO 8613-1 and follows the standardized proforma and notation defined in ISO 8613-1 Annex F. The DAP is based on ODA as defined in ISO 8613 and the Tiled Raster Graphics Addendum to ISO 8613, Part 7.

This DAP specifies an interchange format suitable for transfer of structured documents between equipment designed for raster processing. The documents supported by this DAP are based on a paradigm of an electronic engineering drawing or illustration. Such documents contain one or more pages. Each page consists of an image in the form of a bi-tonal raster graphics content. There is no restriction on the minimum size of the image.

This document defines a DAP that allows large format raster documents to be interchanged in a formatted form in accordance with ISO 8613.

It is assumed that, when negotiation is performed by the service using this DAP, all non-basic values are subject to negotiation.

This DAP is independent of the processes carried out in an end system to create, edit, or reproduce raster documents. It is also independent of the means to transfer the document which, for example, may be by means of communication links or exchanged storage media.

The features of a document that can be interchanged using this DAP fall into the following categories:

a. Page format features - these concern how the layout of each page of a document will appear when reproduced.

b. Raster graphics layout and imaging features - these concern how the document content will appear within pages of the reproduced document.

c. Raster graphics coding - these concern the raster graphics representations and control functions that make up the document raster graphics content.

APPENDIX A

20. NORMATIVE REFERENCES

The following references are required in order to implement this DAP:

20.1 **ISO**.

a. ISO 8613-1 : 1989, Information processing - Text and Office Systems; Office Document Architecture (ODA) and Interchange Format - Part 1: Introduction and General Principles.

b. ISO 8613-1 : 1991, Information Processing - Text and Office Systems; Office Document Architecture (ODA) and Interchange Format - Part 1: Annex F - A Document Application Profile Proforma and Notation.

c. ISO 8613-2 : 1989, Information processing - Text and Office Systems; Office Document Architecture (ODA) and Interchange Format - Part 2: Document Structures.

d. ISO 8613-4 : 1989, Information processing - Text and Office Systems; Office Document Architecture (ODA) and Interchange Format - Part 4: Document Profile.

e. ISO 8613-5 : 1989, Information processing - Text and Office Systems; Office Document Architecture (ODA) and Interchange Format - Part 5: Office Document Interchange Format.

f. ISO 8613-7 : 1989, Information processing - Text and Office Systems; Office Document Architecture (ODA) and Interchange Format - Part 7: Raster Graphics Content Architectures.

g. ISO 8613-7 : (to be published), Information processing - Text and Office Systems; Office Document Architecture (ODA) and Interchange Format - Part 7: Amendment - Tiled Raster Graphics Addendum to ISO 8613, Part 7.

h. ISO 8613-7 : (to be published), Information processing - Text and Office Systems; Office Document Architecture (ODA) and Interchange Format - Part 7: Amendment - Additional Bit Order Mapping Addendum.

i. ISO 8824 : 1987, Information Processing Systems - Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1).

j. ISO 8825 : 1987, Information Processing Systems - Open Systems Interconnection - Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1).

k. ISO 8879 : 1986, Information processing - Text and office systems - Standard Generalized Markup Language (SGML).

l. ISO 8879 : 1986, Information processing - Text and office systems - Standard Generalized Markup Language (SGML), Amendment 1.

m. ISO 9069 : 1988, Information processing - SGML support facilities - SGML Document Interchange Format (SDIF).

20.2 **CCITT**.

a. Recommendation T.4 : 1988, Standardization of Group 3 Facsimile Apparatus for Document Transmission.

b. Recommendation T.6 : 1988, Facsimile Coding Schemes and Coding Control Functions for Group 4 Facsimile Apparatus.

APPENDIX A

30. DEFINITIONS AND TERMINOLOGY

30.1 **Definitions**. The definitions given in ISO 8613-1 are applicable to this document.

30.2 **Constituent names**. Each constituent that may be included in a document that conforms to this profile has been given a unique name which serves to identify that constituent throughout this profile.

The convention is that full names are used (i.e., no abbreviations are used), two or more words in a name are concatenated and each word begins with a capital. Examples of constituent names used in this profile are CompositePage, DocumentLayoutRoot, and SpecificBlock.

In clause 70, each constituent provided by this profile is underlined once at the point in the text at which the purpose of that constituent is defined. This also serves to identify all the constituents provided by this profile.

The same constituent names are also used in the technical specification in clause 80 so that there is a one-to-one correspondence between the use of these names in clauses 70 and 80.

Although the constituent names relate to the purpose of the constituents, the semantics of constituents must not be implied from the actual names that are used. Also, these names do not appear in an interchanged document but a mechanism for identifying constituents in an interchange document is provided. Thus in an application using this profile, the constituents may be known to the user by different names.

40. RELATIONSHIP TO OTHER DAPs

Functionally, this DAP is a functional superset of the CCITT Recommendation T.503, A Document Application Profile for the Interchange of Group 4 Facsimile Documents. This DAP is a functional subset of Part 22 - ODA Image DAP.

APPENDIX A

50. CONFORMANCE

In order to conform to this DAP, a data stream representing a document must meet the requirements specified in 50.1.

The requirements for implementations that originate and/or receive data streams conforming to this DAP are specified in 50.2.

50.1 **Data stream conformance**. The following requirements apply to the encoding of data streams that conform to these agreements:

a. The data stream shall be encoded in accordance with the ASN.1 encoding rules defined in ISO 8825 or the SGML grammar and syntax of ISO 8879.

b. The data stream shall be structured in accordance with the interchange format defined in clause 8.

c. The document shall be structured in accordance with only the formatted document architecture class specified in clause 80. In addition, the document shall contain all mandatory constituents specified for that class and may optionally contain constituents permitted for that class as specified in clause 80.

d. Each constituent shall contain all those attributes specified as required for that constituent in this profile. Other attributes may be specified provided they are permitted for that constituent.

e. The attributes shall have values within the range of permissible values specified in this profile.

f. The encoded document shall be structured in accordance with the abstract document architecture defined in ISO 8613-2.

g. The encoded document shall be structured in accordance with the characteristics defined in clause 70 and shall contain only those features defined in clause 70.

50.2 **Implementation conformance**. This clause states the requirements for implementations claiming conformance to this DAP.

A conforming receiving implementation must be capable of receiving either any data streams conforming to this profile structured in accordance with ODIF or any data streams conforming to this profile structured in accordance with ODL or both of these. Receiving usually, but not always, involves recognizing and further processing the data stream elements.

APPENDIX A

60. CHARACTERISTICS SUPPORTED BY THIS DAP

This clause describes the characteristics of documents that can be represented by data streams conforming to this profile. This clause also describes how these characteristics are represented in terms of divisional components of the data streams.

60.1 **Overview**. This DAP describes the features of ISO 8613 that are needed to support the interchange of documents containing only raster graphics content. It specifies interchange formats for the transfer of structured documents with simple layout structures.

This DAP describes documents that can be interchanged in the formatted form, which facilitates the reproduction of a document as intended by the originator.

Only one category of content is allowed within the document, that is, a raster graphics content in the formatted processable form. This is intended to facilitate the reproduction of the document content as intended by the originator.

This clause describes the layout features that can be represented in documents conforming to this DAP. The features are described in terms that are typical of the user-perceived capabilities and semantics found in a raster document interchange environment.

For the purpose of interchange, a document is represented as a collection of constituents, each of which is represented by a set of attributes. The constituents that make up a formatted document are defined below in this clause and are illustrated in figure 5.

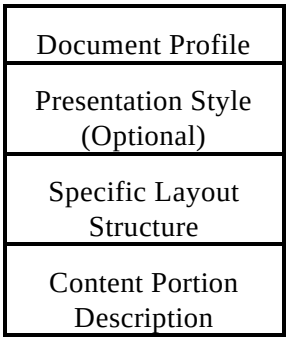


FIGURE 5. Constituents.

Constituents defined as required must occur in any document that conforms to this profile. Constituents listed as optional may or may not be present in the document, depending on the requirements of the particular document.

The required constituents include:

a. A document profile.

b. Layout object descriptions representing a specific layout structure.

c. Content portion description.

The only optional constituent is the presentation style.

60.2 **Logical constituents**. Not applicable.

60.3 **Layout constituents**. This clause describes the features of the layout objects that can be represented in documents conforming to this DAP.

60.3.1 **Overview of the layout characteristics**. The document structure allows the document content to be laid out and presented in one or more pages. Each page in a document consists of only a single raster graphics content representing an engineering drawing, illustration, or other raster scanned image.

A specific layout structure of the document conforming to this application profile consists of a four-level hierarchy consisting of a document layout root, composite pages, frames, and blocks. The document can consist of multiple composite pages where each page represents a single image. Each composite page consists of a frame which in turn contains a block containing the content associated with the image.

Figure 6 is an illustration of the features of the document layout structure supported by this DAP.

60.3.2 **Document Layout Root**. A DocumentLayoutRoot is the top level in a document layout structure. A DocumentLayoutRoot consists of a sequence of one or more CompositePage constituent constraints.

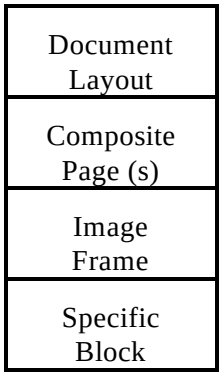


FIGURE 6. Document layout structure.

60.3.3 **Page characteristics**. Only one constituent constraint is provided to present pages within a document.

APPENDIX A

A document consists of a sequence of one or more composite pages. In a document's composite page, a frame is used to position a single raster graphics content representing the image on the page.

A document may consist of multiple pages of different sizes. Each page may be either landscape or portrait orientation. Both orientations are permitted in the document.

60.3.3.1 **Composite page**. A CompositePage is a constituent constraint which defines a composite-page that corresponds to the page area used for presenting the sequence of an ImageFrame frame.

60.3.3.2 **Page dimensions**. A wide variety of page dimensions are supported including large format raster documents. The dimensions of the pages may be specified as any value, in BMU measurement units, including the larger sizes produced from foldout-size images and roll paper. These sizes apply to both portrait and landscape orientations. The page sizes include: ISO A0-A5, ANSI A-K, Japanese legal and letter, foldouts (11 in. X 14 in. and 11 in. X 17 in.), and 11 inch roll paper (see table III).

Dimensions equivalent to or less than the Common Assured Reproduction Area (CARA) of ISO A4 and North American Letter (NAL) in portrait or landscape orientation are basic values. Larger page sizes including those produced from roll paper are non-basic and their use must be indicated in the document profile (see table IV).

The default dimensions are the CARA of North American Letter (A). Any default page dimensions may be specified in the document profile subject to the maximum dimensions defined above by using the "page-dimensions" attribute. The "page-position" attribute may be used to specify the position of the pel array image on the page. Although actual page dimensions may be used allowing for the raster content to completely fill a page leaving no borders, it is advised that the assured reproduction area (ARA) listed in table III be used wherever feasible. See 7.3 of ISO 8613-2 for general rules for positioning pages on presentation surfaces.

60.3.3.3 **Nominal page sizes**. The nominal page sizes that may be specified are listed in table III. In addition, 11 inch roll paper of any length is supported. These may be specified in portrait or landscape orientations. All values of nominal page size are non-basic and hence all values used in a document must be indicated in the document profile using the "medium type" attribute (see table IV).

Any of the nominal page sizes defined in table III, subject to the restriction specified above, may be specified as the default value in the document profile.

Table III also includes the recommended ARA. Information loss may occur when a document is reproduced if the dimensions of the CompositePage exceed the ARA for the specified nominal page size.

60.3.4 **ImageFrame**. An ImageFrame is a constituent constraint which defines a lowest level frame used for laying out the image of an engineering drawing, illustration, or other raster scanned image. This frame contains a single SpecificBlock containing a raster graphics content portion. Note that there must be exactly one ImageFrame on each page and one block in the frame.

TABLE III. Dimensions for various page sizes.

Page type	Size	Size (BMU)	ARA (BMU)
-Metric			
ISO-A5	148mm x 210mm	7015 x 9920	not defined
ISO-A4	210mm x 297mm	9920 x 14030	9240 x 13200
ISO-A3	297mm x 420mm	14030 x 19840	13200 x 18480
ISO-A2	420mm x 594mm	19840 x 28060	18898 x 27118
ISO-A1	594mm x 841mm	28060 x 39680	26173 x 37843
ISO-A0	841mm x 1189mm	39680 x 56120	37843 x 54283
-ANSI, North American (NA)			
NA-A	8.5in x 11in	10200 x 13200	9240 x 12400
NA-B	11in x 17in	13200 x 20400	12744 x 19656
NA-C	17in x 22in	20400 x 26400	19500 x 25800
NA-D	22in x 34in	26400 x 40800	25800 x 39600
NA-E	34in x 44in	40800 x 52800	39600 x 52200
NA-F	28in x 40in	33600 x 48000	32400 x 47400
NA-G	11in x 90in	13200 x 108000	12400 x 106800
NA-H	28in x 143in	33600 x 171600	31400 x 170400
NA-J	34in x 176in	40800 x 211200	39600 x 210000
NA-K	40in x 143in	48000 x 171600	47400 x 170400
NA-Legal	8.5in x 14in	10200 x 16800	9240 x 15480
-Foldouts			
Small	11in x 14in	13200 x 16800	12744 x 15480
NA-B	11in x 17in	13200 x 20400	12744 x 19656
-Japan			
Legal	257mm x 364mm	12141 x 17196	11200 x 15300
Letter	182mm x 257mm	8598 x 12141	7600 x 10200

NOTE: These page sizes are for the portrait orientation.

The frame has a fixed position that is equal to the origin of the page. The vertical and horizontal dimensions of this frame are fixed and equal to the maximum size that can be achieved for the position within the area of the page.

60.3.5 **SpecificBlock**. A SpecificBlock is a constituent constraint which defines a basic layout object used to position and image the content portions associated with an ImageFrame.

The position of the block is fixed and defaults to the origin of the superior frame. The dimensions default to the maximum size that can be achieved for the position within the area of the superior frame.

TABLE IV. Layout attributes.

Attributes	**Basic values**	**Default values**	**Non-basic values**
Page dimensions *	CARA NA A, ISO A4	CARA NA-A	ARA NA B-K, ISO A0-A3,Japan legal, 11" Roll Paper
Medium-type * (Nominal page size)	None	None	NA A-K, ISO A0-A5, Japan letter & legal, 11" Roll Paper

NOTE:
*See table III

60.4 **Document layout characteristics**. This DAP provides only for formatted documents. Hence, no provision is made for constraining the document layout process other than as implied in the formatted documents supported by this DAP. In particular, these formatted documents are characterized by the following:

a. Documents containing only composite pages.

b. Documents may contain one or more pages.

c. Pages may vary by orientation within a document.

d. Each page contains a single raster graphics content portion representing the image.

e. Content is positioned within fixed position and dimension frames.

60.5 **Content layout and imaging control**. A document is modelled as an image represented by a raster graphics content portion, as specified in ISO 8613-7.

The only content architecture that may be specified using the attribute "content architecture class" is formatted processable raster graphics. The formatted processable raster graphics content must be specified as the default in the document profile.

60.5.1 **Raster graphics content**.

60.5.1.1 **Introduction**. This clause defines the features that are applicable to the raster graphics content.

The default values for the following features may be specified in the document profile:

a. Type of coding. (required)

b. Compression.

c. Pel path.

d. Line progression.

e. Pel spacing.

f. Spacing ratio.

The specification in a document of a non-basic value by a presentation or coding attribute must be indicated in the document profile.

60.5.1.2 **Raster graphics content architecture**. The formatted processable raster graphics content is the only content architecture class supported by this DAP and is the only default content architecture class that can be specified in the document profile.

In a composite page, only one content portion can be associated with the image.

60.5.1.3 **Raster graphics encoding methods**. The content may be encoded in accordance with the encoding schemes defined in CCITT Recommendations T.4 and T.6. In the case of T.4, either the one-dimensional or two-dimensional encoding scheme may be used. Also the bitmap encoding scheme defined in ISO 8613-7 may be used.

All these forms of encoding may be used in a single document and all are basic values. "Uncompressed" mode of encoding may also be used but only as a non-basic value.

In a content portion, it is required that the coding attribute "number-of-pels-per-line" be specified. The coding attribute "number-of-lines" may also be specified. No restriction is placed on the values that

may be specified for these coding attributes. This profile places no constraints on the size of the pel arrays that may be used.

The type of coding method used is specified by the attribute "type-of-coding". The use of this attribute is mandatory in the "document architecture defaults" of the document profile to define the default value of either "T.6 encoding" (untiled), "T.6 encoding - MSB" (untiled), or "tiled encoding". The use of this attribute in the description of the content portions is non-mandatory. If this attribute is not specified for a particular content portion, then the default value specified in the "document architecture defaults" of the document profile is used.

If the tiled encoding method is used, the default value of 512 for the "number of pels per tile line" and "number of lines per tile" must be used. No other values are supported, therefore these two attributes do not need to be specified. If the "tile types" attribute is not present, then all tiles will be T.6 encoded. If it is present, then there must be a value specified for each tile in which case only "null background", "null foreground", "T.6 encoded", "T.6 encoded - MSB", or "bitmap encoded" values are supported. The T.4 encodings are not supported. There are no restrictions on the use of the "tiling offset" attribute other than that specified in ISO 8613-7 Addendum.

See table V, Annex D, for a tabulated list of the attributes and their basic, default, and non-basic values.

60.5.1.4 **Raster presentation**. Raster presentation is controlled by the presentation attributes specified in ISO 8613-7. This DAP provides for additional constraints on these presentation attributes as specified below.

The basic values for the attribute "pel-path" supported by this profile are 0 and 90 degrees. The "pel path" values of 180 and 270 degrees are non-basic.

The basic values for the attribute "line progression" supported by this profile is 270 degrees. The "line progression" value of 90 degrees is non-basic.

Any value may be explicitly specified for pel spacing provided that the spacing between pels is not less than 1 BMU. The pel spacing need not be an integer value. The value of "null" may not be specified because the scalable layout process is not supported. The specification of the spacings of 16, 12, 8, 6, 5, 4, 3, 2, and 1 BMU between adjacent pels are basic. The specification of any other spacing is non-basic and must be specified in the document profile.

NOTE:
The basic pel spacing values listed above are equivalent to resolutions of 75, 100, 150, 200, 240, 300, 400, 600, and 1200 pels per 25.4mm respectively when the BMU is interpreted as 1/1200 inch.

The attribute "pel spacing" specifies two integers, the ratio of which determines the pel spacing. No restriction is placed on the values of these integers.

There are no restrictions on the use of the "clipping" attribute. The "image dimensions" attribute is not supported.

There are no restrictions placed on the value of the "spacing ratio" attribute providing that the resultant line spacing is not less than 1 BMU. Also, the line spacing need not be an integral number of BMUs. All values are basic.

See table VI, Annex D, for a tabulated list of the attributes and their basic, default, and non-basic values.

60.6 **Miscellaneous features**. Specification of the attribute application-comments is optional. When used in conjunction with the "type of coding" of "tiled encoding", it contains a sequence of positive integers, one for each tile in the content portion. The sequence of integers is a set of indices representing the octet offsets to the beginning of the respective tiles, starting from the beginning of the "content-information". A tile index of zero (0) indicates that the respective tile is null. The integers will be sequenced in the same order as the tiles. The tiles will be sequenced primarily in the pel path and secondarily in the line progression direction as defined by the presentation attributes.

60.7 **Document management features**. Every document interchanged in accordance with this DAP must include a document profile containing information which relates to the document as a whole.

The features specified by the document profile are listed below. A definition of the information contained in these features is given in the corresponding attribute definitions in ISO 8613-4.

Document constituent information:

a. Specific layout structure.

b. Presentation styles. (optional)

Document characteristics:

a. Document application profile.

b. Document application profile defaults.

c. Document architecture class.

d. Content architecture class.

e. Interchange format class.

f. ODA version date.

g. Raster graphics content defaults.

Non-basic document characteristics:

a. Page dimensions.

b. Medium type.

c. Raster graphics presentation features.

Document management attributes:

a. Document description. (only document reference supported)

The attributes applicable to the document profile are defined in table VII, Annex D.

70. SPECIFICATION OF CONSTITUENT CONSTRAINTS

70.1 **Document profile constraints**.

70.1.1 **Macro definitions**.

```
-- General macros --
DEFINE(FDA, "{`formatted'}")

DEFINE(DAC, "DocumentProfile (Document-architecture-class)")

DEFINE(FPR,"ASN.1{2 8 2 7 2}")  -- Raster formatted processable --

-- Basic page dimensions. --
DEFINE(BasicPageDimension,"
REQ #horizontal-dimension {REQ #fixed-dimension { 1..9240 }},
REQ #vertical-dimension {REQ #fixed-dimension { 1..12400 }}
| REQ #horizontal-dimension {REQ #fixed-dimension { 1..12400 }},
REQ #vertical-dimension {REQ #fixed-dimension { 1..9240 }}
")
-- Any size equal to or smaller than CARA (Common Assured Reproduction Area) of ISO A4 and NA
A.  Both Portrait and Landscape may be specified. --

-- Non-basic page dimensions. --
DEFINE(NonBasicPageDimensions,"
        {REQ #horizontal-dimension {REQ #fixed-dimension {1..39680}},
        REQ #vertical-dimension {REQ #fixed-dimension {12401..56120}}}
        | {REQ #horizontal-dimension {REQ #fixed-dimension {9241..39680}},
        REQ #vertical-dimension {REQ #fixed-dimension {1..56120}}}
                -- up to ISO A0 portrait  --
        | {REQ #horizontal-dimension {REQ #fixed-dimension {1..56120}},
        REQ #vertical-dimension {REQ #fixed-dimension {9241..39680}}}
        | {REQ #horizontal-dimension {REQ #fixed-dimension {12401..56120}},
        REQ #vertical-dimension {REQ #fixed-dimension {1..39680}}}
                --  up to ISO A0 landscape  --
        | {REQ #horizontal-dimension {REQ #fixed-dimension {1..48000}},
        REQ #vertical-dimension {REQ #fixed-dimension {12401..211200}}}
        | {REQ #horizontal-dimension {REQ #fixed-dimension {9241..48000}},
        REQ #vertical-dimension {REQ #fixed-dimension {1..211200}}}
                -- up to ANSI J/K portrait  --
        | {REQ #horizontal-dimension {REQ #fixed-dimension {1..211200}},
        REQ #vertical-dimension {REQ #fixed-dimension {9241..48000}}}
        | {REQ #horizontal-dimension {REQ #fixed-dimension {12401..211200}},
        REQ #vertical-dimension {REQ #fixed-dimension {1..48000}}}
                --  up to ANSI J/K landscape  --
```

```
        | {REQ #horizontal-dimension {REQ #fixed-dimension {1..12141}},
        REQ #vertical-dimension {REQ #fixed-dimension {12401..17196}}}
        | {REQ #horizontal-dimension {REQ #fixed-dimension {9241..12141}},
        REQ #vertical-dimension {REQ #fixed-dimension {1..17196}}}
                -- up to Japanese legal portrait  --
        | {REQ #horizontal-dimension {REQ #fixed-dimension {1..17196}},
        REQ #vertical-dimension {REQ #fixed-dimension {9241..12141}}}
        | {REQ #horizontal-dimension {REQ #fixed-dimension {12401..17196}},
        REQ #vertical-dimension {REQ #fixed-dimension {1..12141}}}
                --  up to Japanese legal landscape  --
        | {REQ #horizontal-dimension {REQ #fixed-dimension {13200}},
        REQ #vertical-dimension {REQ #fixed-dimension {>= 16801}}}
          --  Any portrait size larger than the typical foldout size (11 in x 14 in) including 11 inch roll
paper.  --
        | {REQ #horizontal-dimension {REQ #fixed-dimension {>= 16801}},
        REQ #vertical-dimension {REQ #fixed-dimension {13200}}}
         --  Any landscape size larger than the typical foldout size (14 in x 11 in) including 11 inch roll
paper --
        ")

DEFINE(PermissiblePageDimensions,"
        {REQ #horizontal-dimension {REQ #fixed-dimension {1..39680}},
        REQ #vertical-dimension {REQ #fixed-dimension {1..56120}}}
                -- up to ISO A0 portrait  --
        | {REQ #horizontal-dimension {REQ #fixed-dimension {1..56120}},
        REQ #vertical-dimension {REQ #fixed-dimension {1..39680}}}
                --  up to ISO A0 landscape  --
        | {REQ #horizontal-dimension {REQ #fixed-dimension {1..48000}},
        REQ #vertical-dimension {REQ #fixed-dimension {1..211200}}}
                -- up to ANSI J/K portrait  --
        | {REQ #horizontal-dimension {REQ #fixed-dimension {1..211200}},
        REQ #vertical-dimension {REQ #fixed-dimension {1..48000}}}
                --  up to ANSI J/K landscape  --
        | {REQ #horizontal-dimension {REQ #fixed-dimension {1..12141}},
        REQ #vertical-dimension {REQ #fixed-dimension {1..17196}}}
                -- up to Japanese legal portrait  --
        | {REQ #horizontal-dimension {REQ #fixed-dimension {1..17196}},
        REQ #vertical-dimension {REQ #fixed-dimension {1..12141}}}
                --  up to Japanese legal landscape  --
        ")

DEFINE(NominalPageSizes,"

-- ISO Page Sizes --
        REQ #horizontal-dimension {7015},  REQ #vertical-dimension {9920}
```

```
            -- ISO A5 Portrait --
        | REQ #horizontal-dimension {9920},  REQ #vertical-dimension {7015}
            -- ISO A5 Landscape --
        | REQ #horizontal-dimension {9920},  REQ #vertical-dimension {14030}
            -- ISO A4 Portrait --
        | REQ #horizontal-dimension {14030},  REQ #vertical-dimension {9920}
            -- ISO A4 Landscape --
        | REQ #horizontal-dimension {14030},  REQ #vertical-dimension {19840}
            -- ISO A3 Portrait --
        | REQ #horizontal-dimension {19840},  REQ #vertical-dimension {14030}
            -- ISO A3 Landscape --
        | REQ #horizontal-dimension {19840},  REQ #vertical-dimension {28060}
            -- ISO A2 Portrait --
        | REQ #horizontal-dimension {28060},  REQ #vertical-dimension {19840}
            -- ISO A2 Landscape --
        | REQ #horizontal-dimension {28060},  REQ #vertical-dimension {39680}
            -- ISO A1 Portrait --
        | REQ #horizontal-dimension {39680},  REQ #vertical-dimension {28060}
            -- ISO A1 Landscape --
        | REQ #horizontal-dimension {39680},  REQ #vertical-dimension {56120}
            -- ISO A0 Portrait --
        | REQ #horizontal-dimension {56120},  REQ #vertical-dimension {39680}
            -- ISO A0 Landscape --

-- ANSI Page Sizes --

        | REQ #horizontal-dimension {10200},  REQ #vertical-dimension {13200}
            -- ANSI A Portrait --
        | REQ #horizontal-dimension {13200},  REQ #vertical-dimension {10200}
            -- ANSI A Landscape --
        | REQ #horizontal-dimension {10200},  REQ #vertical-dimension {16800}
            -- ANSI Legal Portrait --
        | REQ #horizontal-dimension {16800},  REQ #vertical-dimension {10200}
            -- ANSI Legal Landscape --
        | REQ #horizontal-dimension {13200},  REQ #vertical-dimension {20400}
            -- ANSI B Portrait --
        | REQ #horizontal-dimension {20400},  REQ #vertical-dimension {13200}
            -- ANSI B Landscape --
        | REQ #horizontal-dimension {20400},  REQ #vertical-dimension {26400}
            -- ANSI C Portrait --
        | REQ #horizontal-dimension {26400},  REQ #vertical-dimension {20400}
            -- ANSI C Landscape --
        | REQ #horizontal-dimension {26400},  REQ #vertical-dimension {40800}
            -- ANSI D Portrait --
```

```
        | REQ #horizontal-dimension {40800},  REQ #vertical-dimension {26400}
                -- ANSI D Landscape --
        | REQ #horizontal-dimension {40800},  REQ #vertical-dimension {52800}
                -- ANSI E Portrait --
        | REQ #horizontal-dimension {52800},  REQ #vertical-dimension {40800}
                -- ANSI E Landscape --
        | REQ #horizontal-dimension {33600},  REQ #vertical-dimension {48000}
                -- ANSI F Portrait --
        | REQ #horizontal-dimension {48000},  REQ #vertical-dimension {33600}
                -- ANSI F Landscape --
        | REQ #horizontal-dimension {13200},  REQ #vertical-dimension {108000}
                -- ANSI G Portrait --
        | REQ #horizontal-dimension {108000},  REQ #vertical-dimension {13200}
                -- ANSI G Landscape --
        | REQ #horizontal-dimension {33600},  REQ #vertical-dimension {171600}
                -- ANSI H Portrait --
        | REQ #horizontal-dimension {171600},  REQ #vertical-dimension {33600}
                -- ANSI H Landscape --
        | REQ #horizontal-dimension {40800},  REQ #vertical-dimension {211200}
                -- ANSI J Portrait --
        | REQ #horizontal-dimension {211200},  REQ #vertical-dimension {40800}
                -- ANSI J Landscape --
        | REQ #horizontal-dimension {48000},  REQ #vertical-dimension {171600}
                -- ANSI K Portrait --
        | REQ #horizontal-dimension {171600},  REQ #vertical-dimension {48000}
                -- ANSI K Landscape --

-- Foldouts --

   | REQ #horizontal-dimension {13200},  REQ #vertical-dimension {16800}
                -- Foldout Portrait --
   | REQ #horizontal-dimension {16800},  REQ #vertical-dimension {13200}
                -- Foldout Landscape --
   | REQ #horizontal-dimension {13200},  REQ #vertical-dimension {>= 16801}
    -- Any portrait size larger than the typical foldout size (11 in x 14 in) including 11 inch roll paper --
   | REQ #horizontal-dimension {>= 16801},  REQ #vertical-dimension {13200}
    -- Any landscape size larger than the typical foldout size (14 in x 11 in) including 11 inch roll paper
--
")
```

70.1.2 **Constituent constraints**.

70.1.2.1 **Document profile**.

```
{

-- Presence of document constituents --

        REQ    Specific-layout-structure        {`present'},
        PERM   Presentation-styles              {`present'},

-- Document characteristics --

        REQ    Document-application-profile{-- See clause 8 for a definition of the permitted values
for this attribute. --},

        REQ    Document-application-profile-defaults {

        -- Document architecture defaults --

                REQ    #content-architecture-class {$FPR},
                PERM   #dimensions              {$PermissiblePageDimensions},
                PERM   #medium-type             {
                        PERM   #nominal-page-size    {$NominalPageSizes},
                        PERM   #side-of-sheet   {ANY_VALUE}},

                -- Any permitted medium type. Both landscape and portrait may be specified. --

                REQ    #type-of-coding          {ASN.1 {2 8 3 7 0} -- T6 encoding --
                                                | ASN.1 {2 8 3 7 5} -- tiled encoding --
                                                | ASN.1 (2 8 3 7 6}  -- T6 encoding -MSB -- },
                PERM   #page-position           {ANY_VALUE},
                PERM   raster-graphics-contents-defaults{
                PERM   #pel-path                {ANY_VALUE},
                PERM   #line-progression        {ANY_VALUE},
                        PERM   #pel-spacing     {REQ #length {ANY_VALUE},
                                REQ #pel-spaces {ANY_VALUE}},
                        PERM   #spacing-ratio
                        {REQ   #line-spacing-value {ANY_VALUE},
                        REQ    #pel-spacing-value {ANY_VALUE}},
                        PERM   #compression     {ANY_VALUE}},

        REQ    Document-architecture-class      {$FDA},
        REQ    Content-architecture-classes     {$FPR},
```

```
        REQ   Interchange-format-class      {-- This attribute required only for ODIF interchange.
                                            See clause 8 for a definition of the permitted values for
                                            this attribute. --},
        REQ   ODA-version
              {REQ #standard-or-recommendation {`ISO 8613'},
              REQ #publication-date         {`1991-12-31'}},
              -- This date represents the date that this DAP was approved.  This is the only approved
              value,
              -- however, the date will be changed if the DAP is significantly revised.  If the date is
revised, use
              -- of the new date is required only when the additional functionality is being used.  That
is, legacy
              -- products may continue to support the earlier DAP.

        -- Non-basic document characteristics --

              PERM  Page-dimensions       {MUL {$NonBasicPageDimensions}},
              PERM  Medium-types          {MUL{
                    PERM  #nominal-page-size {$NominalPageSizes},
                    PERM  #side-of-sheet  {ANY_VALUE}}},
                    -- All values of "medium type" are non-basic --
              PERM  Coding-attributes     {
                    REQ #raster-graphics-coding-attributes {
                          REQ #compression   {'uncompressed'}}},

              PERM  Presentation-features   {
                    PERM  #Raster-graphics-presentation-features  {MUL{
                    | PERM          #pel-path{`180-degrees' |
                                    `270-degrees'}
                    | PERM          #line-progression{`90-degrees'}
                          | PERM#pel-spacing {REQ#length {ANY_VALUE}
                                    EXCEPT   {16,12,8,6,5,4,3,2,1},
                                    REQ#pel-spaces {ANY_VALUE}
                                    EXCEPT{1}}
                          | PERM #spacing-ratio
                          {REQ #line-spacing-value {ANY_VALUE} EXCEPT
                                    {1},
                          REQ #pel-spacing-value {ANY_VALUE} EXCEPT
                                    {1}}}}},

-- Document management attributes --

        -- Document description --
        REQ  Document-reference             {ANY_VALUE}
}
```

70.2 **Logical constituent constraints**. No logical constituents applicable in this clause.

70.3 **Layout constituent Constraints**.

70.3.1 **Macro definitions**.

```
DEFINE(RAST,"       CONTENT_ID_OF(Raster-graphics-content-portion)")
```

70.3.2 **Factor constraints**.

```
FACTOR              ANY-LAYOUT        {

SPECIFIC:
PERM  Object-type                     {VIRTUAL},
REQ   Object-identifier               {ANY_VALUE},
PERM  Subordinates                    {VIRTUAL},
PERM  User-visible-name               {ANY_VALUE},
PERM  User-readable-comments          {ANY_VALUE}
}
```

70.3.3 **Constituent constraints**.

70.3.1 **DocumentLayoutRoot**.

```
DocumentLayoutRoot:         ANY-LAYOUT        {

SPECIFIC:
REQ   Object-type                     { `document-layout-root'},
REQ   Subordinates                    {SUB_ID_OF(CompositePage)+}
}
```

70.3.3.2 **CompositePage**.

```
CompositePage:      ANY-LAYOUT        {

SPECIFIC:
REQ   Object-type                     {`page'},
REQ   Subordinates                    {SUB_ID_OF(ImageFrame)},
PERM  Dimensions                      {$PermissiblePageDimensions},
PERM  Page-position                   {ANY_VALUE},
PERM  Medium-type                     {PERM #nominal-page-size {$NominalPageSizes},
                                      PERM #side-of-sheet {ANY_VALUE}},
PERM  Application-comments            {ANY_VALUE}
}
```

70.3.3.3 **ImageFrame**.

```
ImageFrame:          ANY-LAYOUT        {

SPECIFIC:
REQ    Object-type                     {`frame'},
REQ    Subordinates                    {SUB_ID_OF(SpecificBlock)},
PERM   Application-comments            {ANY_VALUE}
}
```

70.3.3.4 **SpecificBlock**.

```
SpecificBlock                          {
SPECIFIC:
REQ    Object-type                     {`block'},
REQ    Object-identifier               {ANY_VALUE},
REQ    Content-portions                {$RAST},
PERM   Position                        {REQ #fixed-position   {
                                       REQ #horizontal-position {ANY_VALUE},
                                       REQ #vertical-position {ANY_VALUE}}},
PERM   Dimensions                      {REQ #horizontal-dimension
                                       {REQ #fixed-dimension{ANY_VALUE}},
                                       REQ #vertical-dimension
                                       {REQ #fixed-dimension{ANY_VALUE}}},
PERM   Content-architecture-class      {$FPR},
PERM   User-readable-comments          {ANY_STRING},
PERM   User-visible-name               {ANY_STRING},
PERM   Application-comments            {ANY_VALUE},
                              -- See 80.1.2 and 80.2.3 --
PERM   Presentation-style              {STYLE_ID_OF(PStyle)},
              -- PStyle for raster content --
PERM   Presentation-attributes         {
       PERM   #raster-graphics-attributes {
              PERM   #pel-path         {ANY_VALUE},
              PERM   #line-progression {ANY_VALUE},
              PERM   #pel-spacing      {REQ #length {ANY_VALUE},
                                       REQ #pel-spaces {ANY_VALUE}},
              PERM   #spacing-ratio    {REQ #line-spacing-value {ANY_VALUE},
                                       REQ #pel-spacing-value {ANY_VALUE}},
              PERM   #clipping         {ANY_VALUE}}}
```

70.4 **Layout style constraints**. No layout style constraints applicable in this clause.

70.5 **Presentation style constraints**.

70.5.1 **Macro definitions**. No macro definitions are applicable to this clause.

70.5.2 **Factor constraints**.

```
FACTOR:ANY-PRESENTATION-STYLE{

REQ   Presentation-style-identifier     {ANY_VALUE},
PERM  User-readable-comments            {ANY_STRING},
PERM  User-visible-name                 {ANY_STRING}
}
```

70.5.3 **Presentation style constituent constraint**.

70.5.3.1 **PStyle**.

```
PStyle: ANY-PRESENTATION-STYLE        {

        -- This style is used for raster graphics content --

PERM  Presentation-attributes           {
        PERM  #raster-graphics-attributes {
                PERM  #pel-path         {ANY_VALUE},
                PERM  #line-progression {ANY_VALUE},
                PERM  #pel-spacing      {REQ #length {ANY_VALUE},
                                         REQ #pel-spaces {ANY_VALUE}},
                PERM  #spacing-ratio    {REQ #line-spacing-value {ANY_VALUE},
                                         REQ #pel-spacing-value {ANY_VALUE}},
                PERM  #clipping         {ANY_VALUE}}}
}
```

70.6 **Content portion constraints**.

70.6.1 **Macro definitions**.

```
DEFINE(TILED,"ASN.1{2 8 3 7 5}")  -- Tiled raster encoding --
```

70.6.2 **Factor constraints**. No factor constraints are applicable to this clause.

70.6.3 **Constituent constraints**.

70.6.3.1 **Raster graphics content portion**.

```
Raster-graphics-content-portion         {
```

```
REQ   Content-identifier-layout       {ANY_VALUE},
PERM  Type-of-coding                  { ASN.1{2 8 3 7 0}  -- T.6 encoding --
                                      | ASN.1{2 8 3 7 1}  -- T.4 one dimensional --
                                      | ASN.1{2 8 3 7 2}  -- T.4 two dimensional --
                                      | ASN.1{2 8 3 7 3}  -- bitmap encoding --
                                      | ASN.1{2 8 3 7 5}  -- tiled encoding --
                                      | ASN.1{2 8 3 7 6}  -- T.6 encoding - MSB --
                                      | ASN.1{2 8 3 7 7}  -- T.4 one dimensional - MSB --
                                      | ASN.1{2 8 3 7 8}  -- T.4 two dimensional - MSB --},

PERM  Coding-attributes               {
      REQ#raster-graphics-coding-attributes{
            PERM#compression    {ANY_VALUE},
            PERM#number-of-lines {>0},
            REQ#number-of-pels-per-line {>0},
            CASE Raster-graphics-content-portion (Type-of-coding) OF {

            {$TILED}:{PERM#number-of-pels-per-tile-line {512},
                  PERM#number-of-lines-per-tile {512},
                  PERM#tiling-offset     {ANY_VALUE},
                  PERM#tile-types        {`null background' |
                                          `null foreground' |
                                          `T.6 encoded' |
                                          `bitmap encoded' |
                                          `T.6 encoded - MSB'}}}},
PERM  Alternative-representation      {ANY_STRING},
PERM  Content-information             {RASTER}
}
```

70.7 **Additional usage constraints**. No other usage constraints are currently defined.

APPENDIX A

80. INTERCHANGE FORMAT

Two interchange formats are supported by this profile. The Interchange format ODIF (class A) can be used by applications requiring a binary encoding based on ASN.1. The Interchange Format SDIF can be used by applications requiring a SGML based clear text encoding. This latter interchange format is an SGML application, called Office Document Language (ODL). For the purposes of interchange, the ODL ENTITIES are placed in an ASN.1 wrapper, as defined by SDIF. Each encoding form has inherent advantages. Conversion of document encoded in one interchange format into the other should not produce the loss of semantic document information.

80.1 **Interchange format ODIF (class A)**.

80.1.1 **Interchange format**.

The value of the document profile attribute "interchange format" for this interchange format is `if-a'. This form of ODIF is defined in ISO 8613-5.

The encoding is in accordance with the Basic Encoding Rules for Abstract Syntax Notation One (ASN.1), as defined in ISO 8825.

80.1.2 **DAP identifier**.

The value for the document profile attribute "document application profile" for this interchange format is represented by the following object identifier.

iso (1) identified-organization (3) oiw (14) odasig (11) image-appl (1) raster-dap-odif (1)

80.1.3 **Encoding of application comments**.

ISO 8613-5 define the encoding of the attribute "application comments" as an octet string. For SpecificBlock, this DAP requires that the encoding within that octet string be in accordance with the ASN.1 syntax specified in the following module definition.

```
NIST-DAPSpecification
DEFINITIONS        ::=       BEGIN
EXPORTS Object-Appl-Comm-Encoding;

Object-Appl-Comm-Encoding  ::=  SEQUENCE OF INTEGER
END
```

80.2 **Interchange format SDIF**.

80.2.1 **Interchange format**.

The document profile attribute "interchange format" does not apply for this interchange format. The SDIF encoding of ODA is defined in Annex E of ISO 8613-5. In addition, ISO 8613 contains additional specifications for this encoding of ODA.

80.2.2 **DAP identifier**.

The value for this attribute "document application profile" for this interchange format is represented by the following object identifier.

iso (1) identified-organization (3) oiw (14) odasig (11) image-appl (1) raster-dap-sdif (2)

80.2.3 **Encoding of application comments**.

For SpecificBlock, the encoding of the attribute "application comments" is defined in a data stream conforming to this profile with the following DTD definition:

<!-- The following set of declarations may be invoked by using a public entity as follows:

<!DOCTYPE odaac Public "-//USA-OIW//DTD SGML ENCODING ODA APPLICATION COMMENTS//EN">
-- >

<!-- NOTE: To parse the following Document Type Declaration Subset, place the Document Type declaration" <!DOCTYPE odaac [" at the beginning of the file and "]>" at the end of the file. -->

<!ELEMENT odaac - - (objappc)+ >

<!-- Object application comment -->
<!ELEMENT objappc- O (#PCDATA)>

80.3 **Encoding of raster content information**. The encoding of raster content information in the bitmap encoding scheme is that specified in 9.3 of the raster graphics content architecture part of ISO 8613-7, that is, the first pel in the order of bits is allocated to the most significant bit of an octet. The encoding of the code words in the CCITT Recommendation T.4 and T.6 encoding scheme may be done in either the up or down bit order. The bit order is specified by the attributes "type of coding" or "tile types". The attribute "tile types" is used only when the value for "type of coding" is 'tiled encoded'. For the up order, it is such that the first or only bit of the first code word shall be placed in the direction of more significant bits in the first and following octets. For the down order, it is such that the first or only bit of the first code word shall be placed in the most significant bit (MSB) of the first octet. Subsequent bits of the first and following code words are placed in the direction of least significant bits in the first and following octets.

APPENDIX A

ANNEX A (normative)

Amendments and corrigenda

A.1 **Amendments**.

A.1.1 **Amendments to the base standard**. The amendments applicable to this DAP includes the ISO 8613 - Amendment 1: 1990. This amendment includes text to be included in ISO 8613-1 as the following annexes:

a. Annex E: Use of ISO/IEC 10021 (MOTIS) to interchange documents conforming to ISO 8613.

b. Annex F: Document application profile proforma and notation.

c. Annex G: Conformance testing methodology.

d. Annex H: Recording of documents conforming to ISO 8613 on flexible disk cartridges conforming to ISO 9293.

In addition, this amendment addresses the inclusion of the ISO 8613 Technical Corrigenda 1.

This DAP does not include the following features of the amendment:

a. Addendum on security.

b. Addendum on styles.

c. Addendum on alternative representation.

Additionally, this DAP includes features from the Tiled Raster Graphics Addendum to ISO 8613-7, ISO/IEC JTC1/SC18/WG5 901, dated September 1990, and the Additional Bit Order Mapping Addendum to CCITT Rec. T.417|ISO 8613-7, ISO/IEC JTC 1/WG 3, dated July 1991. A new version of ISO 8613-7 which also will incorporate the Colour Addendum is scheduled to be issued in 1992.

A.2 **Corrigenda**.

A.2.1 **Corrigenda to this DAP**. The pervious version of the document (June 1992) incorporated editorial and technical changes approved at the March 1992 ODA special interest group (SIG) meeting as well as minor editorial changes approved at the June 1992 ODA SIG meeting. Technical changes included: addition of CCITT T.4 support, change basic value support for page sizes and pel spacing, addition of position and dimension features, and addition of object identifiers. These changes were made to align more closely with FOD36 DAP, harmonize with Profile Alignment Group for ODA (PAGODA), and support Association for Information and Image Management (AIIM) requirements.

APPENDIX A

This version of the document (September 1992) incorporates one technical and other editorial changes approved at the September 1992 ODA SIG meeting. The technical change order was to add object identifiers to the "type of coding" attribute to support both up and down bit order sequences.

APPENDIX A

ANNEX B (normative)

Recommended Practices

B.1 **Transfer methods for ODA**.

B.1.1 **Conveyance of ODA over CCITT X.400-1984**. This recommendation describes how ODA body parts are to be encoded for transmission over a CCITT X.400-1984 service.

An ODA body part is encoded as OdaBodyPart in the definition given below:

```
OdaBodyPart ::= SEQUENCE { OdaBodyPartParameters, OdaData }
OdaBodyPartParameters ::= SET {
        document-application-profile
                [0] IMPLICIT OBJECT IDENTIFER,
        document-architecture-class
                [1] IMPLICIT INTEGER {
                        formatted (0),
                        processable (1),
                        formatted-processable (2) }
OdaData ::=SEQUENCE OF Interchange-Data-Element
```

NOTE:
It is recommended to transfer an ODA document as a single body part with tag 12:

```
Oda [12] IMPLICIT OCTETSTRING
```

The content of the octet string is encoded as OdaBodyPart, defined above. However, this is out of the scope of this profile.

B.1.2 **Conveyance of ODA over File Transfer, Access, and Management (FTAM)**. This recommendation describes the FTAM Document Type to be used for minimal storage and transfer capabilities of ODA data streams. It is recognized that enhanced capabilities may at some point be added. When using FTAM to transfer an ODA file, the FTAM-3, ISO FTAM Unstructured Binary, document type should be specified. However, since files that do not contain ODA data streams can have the same document type, it is left up to the user of application programs that remotely access files using FTAM to know that a given file contains an ODA data stream.

B.1.3 **Conveyance of ODA over Document Transfer and Manipulation (DTAM)**. This recommendation provides for information concerning the interchange of ODA based documents with DTAM protocols.

DTAM is defined in the T.430-Series of recommendations and is, like ODA, an integral part of the T.400-Series of CCITT Recommendations named Office Document Architecture, Transfer and Manipulation.

The T.520-Series of recommendations contain Communication Application Profiles (CAP). Recommendation T.522 describes the Communication Application Profile BT1 for document bulk transfer. Recommendation T.522 is applicable for the Office Document Format Profile.

NOTE:
The use of BT1 within the end-to-end oriented Telematic Services Telefax 4 and Teletex is described in 7.1 of Recommendation T.561 and 7.1 of Recommendation T.562.

B.1.4 **Conveyance of ODA over flexible disks**. The recommended method for interchanging ODA documents between systems by the exchange of magnetically recorded Flexible Disk Cartridges is by the use of an annex to ISO 8613-1 (to be published), Recoding of Documents Conforming to ISO 8613 on Flexible Cartridges Conforming to ISO 9293. This annex provides for recording each ODA document as a separate file as defined by ISO 9293, Volume and File Structure of Flexible Disk Cartridges for Information Interchange.

NOTE:
Document encoded in ODL can be stored such that each SGML entity is recorded in a separate file or in the case of an SDIF encoding, the file can be stored in a single file.

B.2 **Interoperability with SGML applications**. The recommended method for the exchange of documents between Standard Generalized Markup Language (ISO 8879, SGML) based systems and systems based on this ODA document application profile is by means of exchanging a document representation conforming to these agreements in an encoded form of the SGML language known as the ODL. ODL is a standardized SGML application for representing documents conforming to the ODA base standard. Such a representation can be converted into the ODIF supported by this document application profile.

APPENDIX A

ANNEX C (informative)

References to other standards and registers

CCITT Recommendation T.400 : 1988, Introduction to Document Architecture, Transfer and Manipulation;

CCITT Recommendation T.411 : 1988, Office Document Architecture (ODA) and Interchange Format: Introduction and General Principles.

CCITT Recommendation T.412 : 1988, Office Document Architecture (ODA) and Interchange Format: Document Structures.

CCITT Recommendation T.414 : 1988, Office Document Architecture (ODA) and Interchange Format: Document Profile.

CCITT Recommendation T.415 : 1988, Office Document Architecture (ODA) and Interchange Format: Office Document Interchange Format.

CCITT Recommendation T.417 : 1988, Office Document Architecture (ODA) and Interchange Format: Raster Graphics Content Architecture.

CCITT Recommendation T.503 : 1984, Document Application Profile for the Interchange of Group 4 Facsimile Documents.

ISO 8571 : 1988, Information processing systems - Open Systems Interconnection - File transfer, access and management.

ISO 9070 : 1990, Information processing - SGML support facilities - Registration procedures for public owner identifiers.

ISO/TR 9573 : 1988, Information processing - SGML technical report - Techniques for using SGML.

ISO 10021 : (to be published), Information processing systems - Text communication - Message Oriented Text Interchange System.

ISP FOD26 : (to be published), Office document format profile for the interchange of enhanced function mixed content documents in processable and formatted forms.

ISP FOD36 : (to be published), Office document format profile for the interchange of extended function mixed content documents in processable and formatted forms.

ANNEX D (informative)

Supplementary information on attributes

TABLE V. Content coding attributes.

Attributes	Basic values	Default values	Non-basic values
Number-of-pels-per-line	any positive integer	None	None
Number-of-lines	any positive integer	None	None
Tiling-offset*	(any non-negative integer < 512, any non-negative integer < 512)	(0,0)	None
Tile-types*	T.6 encoded, bitmap encoded, null background, null foreground, T.6 encoded -MSB	T.6 encoded	None
Type-of-coding	T.6 encoding (untiled), bitmap (untiled), tiled encoded, T.4 1D encoding, T.4 2D encoding, T.6 encoding - MSB (untiles), T.4 1D encoding - MSB, T.4 2D encoding - MSB	T.6 encoding, T.6 encoding - MSB, tiled encoding †	None

NOTE:
* Only used if Type-of-coding is "tiled"
† As specified in the document profile

TABLE VI. Presentation attributes.

Attributes	Basic values	Default values	Non-basic values
Pel-path	0, 90 deg	0 deg	180, 270 deg
Line-progression	270 deg	270 deg	90 deg
Pel-spacing	6 BMU (200), 4 BMU (300)	16, 12, 8, 6, 5, 4, 3, 2, 1 BMU	Any value except 'null'

Clipping	Two Coordinate Pairs (any non-negative integer, any non-negative integer)	(0,0), (N-1, L-1)	None

TABLE VII. Document profile attributes.

Attribute	Class	Permissible values
Specific-layout-structure	m	present
Presentation-styles	nm	present
Document-characteristics	M	
Document-architecture-class	m	formatted
Document-application-profile	m	{--See clause 8 for a definition of the permitted values for this attribute.--}
Content-architecture-classes	m	{2 8 2 7 2}
Interchange-format-class	m	A
ODA-version	m	ISO 8613, 1991-12-31
Document-architecture-defaults	M	
Content-architecture-class	m	formatted processable raster graphics
Type-of-coding	m	T.6 encoding, tiled encoding, T.6 encoding - MSB
Page-dimensions	nm	See list in table V, (Default value is NA-A, 9240 x 13200 BMU)
Medium-types	nm	See list in table V, (Default value is NA-A 9240 x 13200 BMU)
Page-position	nm	any coordinate pair within page
Raster-gr-content-defaults	NM	
Pel-path	nm	0, 90, 180, 270 degrees (0 is normal default)
Line-progression	nm	90, 270 degrees (270 is normal default)
Pel-spacing	nm	Any value
Spacing Ratio	nm	Any value

Non-basic-doc-characteristics	NM	
Page-dimensions	nm	See table V
Medium-type	nm	See table V

TABLE VII. Document profile attributes (continued).

Attribute	Class	Permissible values
Raster-gr-presentation-features	NM	
Pel-path	nm	180, 270 degrees
Line-progression	nm	90 degrees
Pel-spacing	nm	Any value except 16, 12, 8, 6, 5, 4, 3, 2, or 1 BMU
Document-management-attributes	M	
Document Reference	m	Any string of characters

NOTE:
The following notation is used in the class column of this table:
m mandatory attribute
nm non-mandatory attribute
d defaultable attribute
Capital letters (M, NM, and D) are used for groups of attributes.

APPENDIX A

ANNEX E (informative)

Register index

TABLE VIII. Object identifiers.

Object identifier	Reference
iso(1) identified-organization (3) oiw (14) odasig (11) image-appl (1) raster-dap-odif (1)	80.1.2
iso (1) identified-organization (3) oiw (14) odasig (11) image-appl (1) raster-dap-sdif (2)	80.2.3

INDEX

PAGE

Acronyms 24
Additional ordering data for Type II procurement 11
Additional usage constraints 52
Aliasing 21
Alignment 8, 12, 19, 20, 55
Amendments 55
Amendments and corrigenda 55
Applicable documents 2
Aspect ratio 8, 19
Attribute 5, 11, 12, 21, 22, 25, 26, 36, 39-41, 47, 48, 53, 54, 56, 61, 62
Basic value 18, 25, 26, 39, 55
Bit 5, 14, 17, 24, 26, 29, 54-56
Bitmap 5, 6, 10-12, 14, 17, 18, 21, 22, 25, 26, 39, 40, 52, 54, 60
Block 4, 5, 12, 22, 25, 26, 35, 36, 38, 50
Byte (octet) boundaries 5
Byte boundary 25
CCITT 3-5, 10-12, 24, 30, 32, 39, 54, 55, 57-59
Changes from previous issue 24
Characteristics supported by this DAP 34
Classification 1, 7, 26
Classification of inspections 7
Cleanness 21
Clipping 25, 39, 41, 47, 50, 51, 60, 61
Composite page 25, 35, 36, 39
Compression 10, 12, 17, 19, 21, 25, 26, 39, 47, 48, 52
Conformance 7, 8, 33, 55
Constituent names 31
Constituents 25, 31, 33-35, 47, 49
Content coding attributes 60
Content layout and imaging control 39
Content portion constraints 51
Continuity 20
Contrast 19
Conveyance of ODA over CCITT X 57
Conveyance of ODA over flexible disks 58
Corrigenda 55
Corrigenda to this DAP 55
Coverage 8, 20
Data acceptance 12
Data requirements 12
Data sampling 8
Data stream conformance 33

INDEX

PAGE

Decoding 5-7, 17, 25
Decoding system 25
Default value 25, 36, 40, 61
Definitions 5, 24, 26, 31, 41, 43, 49, 51, 53
Definitions and terminology 31
Definitions of one and zero in bitmap data 5
Dimensions for various page sizes 37
Document application profile (DAP) 1, 25, 28
Document layout characteristics 38
Document layout root 35
Document layout structure 35
Document management features 41
Document profile attributes 61, 62
Document profile constraints 43
Document type definition (DTD) 25
Encoding 3-7, 10, 11, 14, 17, 22, 24, 26, 28, 29, 33, 39-41, 47, 51-54, 58, 60, 61
Encoding of raster content information 54
Encoding system 26
Evaluation of the scanning process 21
Example of tile order (after rotation) 23
Example of tile order (before rotation) 23
File size and efficiency considerations 12
First article 5, 7, 8, 12
First article inspection 5, 7, 8, 12
Focus 8, 19
Frame 25, 26, 35, 36, 38, 50
Fundamental ordering data 11
General requirements 4
Generation of raster data by scanning 14
Glossary 25
Government documents 2
Header 4, 5, 14, 26
Image sizes for drawings 12
ImageFrame 36, 38, 49, 50
Implementation conformance 33
Initial point 26
Intended use 10
Interchange format 23-25, 28-30, 33, 41, 53, 54, 59
Interchange format ODIF (class A) 53
Interchange format SDIF 53, 54
Interoperability with SGML applications 58

INDEX

PAGE

Introduction 29, 39, 59
ISO 3, 22, 24, 28-31, 33, 34, 36-41, 43-45, 48, 53-55, 57-59, 61, 63
Layout attributes 38
Layout characteristics 26, 35, 38
Layout constituent constraints 49
Layout constituents 35
Layout style constraints 50
Line progression 4, 5, 8, 14, 17, 18, 22, 23, 26, 39-41
Linearity 8, 20
Logical constituent constraints 49
Logical constituents 35, 49
Metric drawing sizes 12, 14
Minimizing file size 6, 21
Miscellaneous features 41
Multiple pages 6, 17, 36
Nominal page size 36, 38
Non-basic value 18, 26, 39
Non-Government publications 2
Normative references 29
North American drawing sizes 13
Note on bit ordering 14
Note on multiple pages 17
Note regarding minimizing file size 21
Note regarding one and zero in bitmap data 18
Note regarding padding of partially filled tiles 17
Note regarding raster image pel density 18
Note regarding Type II untiled/tiled 17
Notes 10, 17, 18
Notes on scanning quality 18
Notes regarding orientation 17
Object identifiers 28, 55, 56, 63
Octet 5, 25, 26, 41, 53, 54, 57
Order of precedence 3
Ordering data 11
Orthogonality 20
Overview 17, 34, 35
Overview of the layout characteristics 35
Packaging 9
Padding of partially imaged tiles 6, 11
Page 4, 6, 11, 14, 17, 19, 22, 25-28, 35-39, 42-45, 47-49, 55, 61, 64
Page characteristics 35

INDEX

PAGE

Pel (picture element) 26
Pel array 17, 25-27, 36
Pel density 4, 11, 12, 18, 20, 26
Pel path 4, 5, 8, 14, 17, 18, 22, 23, 26, 39-41
Pel spacing 14, 26, 27, 39, 40, 55
Presentation attributes 14, 40, 41, 60
Presentation style constraints 51
Prohibition on recommendation T.6 escape option 5
Quality assurance provisions 7
Quality conformance inspection 7, 8
Raster binary data 4, 5, 23
Raster data file header records 4
Raster data type 4
Raster graphics 1, 4, 5, 9-12, 14, 18, 21, 24, 25, 27-29, 34-36, 38, 39, 41, 42, 51, 54, 55, 59, 61
Raster graphics content 11, 12, 14, 21, 25, 27-29, 34-36, 38, 39, 41, 51, 54, 59
Raster graphics encoding methods 39
Raster image orientation 4, 17
Raster image pel count 4
Raster image pel density 4, 11, 18
Raster image scanning 8
Raster presentation 40
Readability 21
Recommended practices 57
References to other standards and registers 59
Register index 63
Registration 8, 20, 59
Relationship to other DAPs 32
Requirements 1, 4, 5, 7-12, 21, 33, 34, 55
Resolution 19, 20, 26
Responsibility for compliance 7
Responsibility for inspection 7
Restriction to Group 4 compression 10
Scale 8, 19, 20
Scope 1, 28, 57
Spacing ratio 27, 39, 41, 61
Specific requirements for Type II raster binary data 5
Specification of constituent constraints 43
Specifications and standards 2
SpecificBlock 31, 36, 38, 50, 53, 54
Subject term listing 27
Supplementary information on attributes 60
Tile 5, 11, 12, 21-23, 26, 27, 40, 41, 52, 54, 60

INDEX

PAGE

Tile index 5, 11, 12, 22, 27, 41
Tile index option 5, 22
Tile ordering 5
Tile orientation 5
Tile size 5, 23
Tile types 5, 11, 40, 54
Transfer methods for ODA 57
Type II data structures 23
Type II orientation and rotation 22
Type II raster graphics presentation and content attributes 10
Untiled/tiled Type II 5, 11
Use of document architecture for Type II raster graphics 10

DOCUMENTS

ANSI Y14.1 . . . . . 2, 12
CCITT Recommendation T.4 . . . . . 3, 10, 54
CCITT Recommendation T.6 . . . . . 3-5, 10-12
FIPS PUB 150 . . . . . 2, 4, 5, 11
FIPS PUB 157 . . . . . 2, 18
ISO 8825 . . . . . 3, 29, 33, 53
ISO 8879 . . . . . 3, 29, 30, 33, 58
MIL-STD-1840 . . . . . 2, 4, 5, 9, 14, 27

CONCLUDING MATERIAL

Custodians:
Army - CR
Navy - SH
Air Force - 16
DLA - DH

Review activities:
Army - AM
Air Force - 01, 02
NSA - NS
DISA - DC
NASA - NA
Others - NIST, DOE, GPO, NCS

User activities:
OASD - IR
Army - AL, AT, AV, EA, ER, GL, ME, MI, SM, TE, TM
Navy - AS, EC, OS, SA, YD
Air Force - 11, 13, 14, 17, 18, 19, 68, 79, 99

Preparing activity:
OASD (P&L) - DO

Agent:
Air Force - 16

(Project IPSC - 0269)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	**1. DOCUMENT NUMBER** MIL-R-28002B	**2. DOCUMENT DATE *(YYMMDD)*** 921214

3. DOCUMENT TITLE

Requirements for Raster Graphics Representation in Binary Format

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME *(Last, First, Middle Initial)*	**b. ORGANIZATION**	
c. ADDRESS *(include Zip Code)*	**d. TELEPHONE *(include Area Code)*** **(1) Commercial** **(2) AUTOVON**	**7. DATE SUBMITTED *(YYMMDD)***

8. PREPARING ACTIVITY

a. NAME Mr William C. Gorham, Jr.	**b. TELEPHONE *(Include Area Code)*** **(1) Commercial** (703) 756-8465 **(2)AUTOVON** 289-8465
c. ADDRESS *(Include Zip Code)* OSD (P&L) CALS/TSD 5203 LEESBURG PIKE SUITE 1609 FALLS CHURCH VA 22041	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 DSN 289-2340